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Blood Plasma Changes and Variations in the Female Bovine Toxaemias*

J. R. BARKER, M.R.C.V.S.,
HEREFORD

Advances in haematology have not been confined to the more formative elements. It is intended here to deal with recent findings with regard to the non-cellular constituents of the blood plasma, namely, the inorganic salts of calcium and magnesium, the glucose content, the inorganic phosphorus and total acetone bodies. It will be shown that a marked deviation from normal has a distinct clinical aspect, fairly easily recognisable, and that the indications for therapy are none the less distinct and remarkable.

In 1933 samples of blood taken from female bovines showing tetany were submitted for biochemical analysis to the Veterinary Laboratory of the Ministry of Agriculture, to the staff of which I am indebted for the analytical figures used. The procedure adopted was that case report schedules issued by the Laboratory for the purpose, were forwarded together with or soon after the blood samples. The biochemical data so obtained will doubtless be utilised by the Laboratory in a more general connection. In what follows the utilisation is solely in connection with clinical observations made upon animals in the county of Hereford as occurring in sequence in general practice.

The word "toxaemia" is used for brevity in description and in the main includes those "nutritional and metabolic disorders" of other authors, namely, milk fever, lactation tetany, acetonaemia, grass tetany and transit tetany and the pregnancy toxaemias. From 1935 onwards all cases coming within any one of the aforementioned categories were the subjects of blood sampling and over 300 cases have been recorded. A striking feature is that although the cattle population of the county of Hereford contains a relatively high proportion of males, entire and emasculated, one sample only and that from a bull calf a few weeks old, has been obtained from male bovines in the practice. It would seem, therefore, that the incidence of this class of disease in Hereford, irrespective of any other factors such as climate, season, nutrition, animal husbandry or breed, is confined to the female of the species. In the search for some indication as to the reason for this the explanation is put forward that recurring physiological plasma changes in the bovine female are primarily responsible. A close scrutiny of the case records as to age incidence reveals that three pregnancies are generally essential before manifestation of the symptoms of the toxaemias of the puerperium or of pregnancy occurs, at least so far as the syndromes

(*a*) Reeling, paresis and narcosis

(*b*) Paddling, paresis and coma

are concerned. The cattle population of the county is divided roughly equally into beef animals, having free range and suckling calves, and dairy cattle, whose calves are removed and the cows subsequently milked by hand or machinery. In this series of cases a milk fever type of case, as occurring in a purely beef animal, has not been encountered. Those toxaemias showing hypomagnesaemia as the main biochemical finding are not so limited to pluriparous animals and have been encountered in maiden heifers and in animals of the dairy or beef type of all ages after puberty. The breeding and sexual cycle of the cow can be divided into the following recognisable periods: parturition, lasting a few hours; puerperium, to which for statistical purposes a provisional period of four days may be fixed; interregnum, to which it has seemed expedient to fix four days also; anoestrus, lasting a varying period dependent upon the individual of from one to six weeks; oestrus, lasting a few hours and, if not followed by service and conception, dioestrus—normally of 21 days—and when conception takes place, pregnancy of 280 days' duration. This annual cycle of physiological

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events forms the basis of these clinical observations. Where blood changes occur at the transition from one period to another, as at the act of parturition, the animal is liable to forsake the physiological for the pathological; especially is this so after constant repetition.

Calcium Salts.—Practically all the calcium in the blood is to be found in the plasma, the normal approximating 10 mg. per 100 c.c. of serum. In the publication of Allcroft and Green[1] the normal physiological range in female bovines is given as 8·6 to 11·5 and the majority of normal values falls within a smaller range of 9·4 to 10·5. Although plasma calcium can be divided into diffusible and indiffusible and each moiety again into adsorbable and nonadsorbable, all the figures upon which this paper is based refer to "total calcium," and no distinction between fixed and free has been made. The highest calcium value found in this series of cases is 16·8 mg. per cent. and the lowest 2·2 mg. per cent. As almost all of these cases were pathological it would appear that any female bovine showing symptoms just prior to parturition or in the puerperium has invariably a reduced blood calcium to be found upon biochemical analysis of a sample of blood taken from a peripheral vein such as the mammary or the jugular. This hypocalcaemia may become progressively more pronounced the further away from onset of symptoms one takes the blood sample in an untreated animal. Somewhere between 5 and 6 mg. per cent. paresis supervenes, to be followed by narcosis, coma or convulsions depending upon the magnesium content of the blood plasma.

Magnesium.—The action of magnesium in the blood plasma seems somewhat antagonistic to that of calcium. The figures now under discussion refer to total "serum magnesium" although, as with calcium, part of the magnesium is fixed to the plasma proteins and part is free in solution. In the paper of Allcroft and Green an average normal value is given as 2·3 mg. per cent. for serum magnesium with a common physiological range 1·8 to 3·1. In the parturition-puerperium stage a hypocalcaemia may be linked up with

(*a*) a hypermagnesaemia
(*b*) a normal magnesium value
or (*c*) a hypomagnesaemia.

Clinically one is able to distinguish these three associations by studying the behaviour of the animal:—

(*a*) Where a hypocalcaemia is linked with a hypermagnesaemia the patient reels, becomes paretic and narcosis supervenes.

(*b*) Where a hypocalcaemia is linked with a normal magnesium the patient "paddles" with the hind legs, becomes recumbent, may or may not get up, finally becomes paretic and coma supervenes.

(*c*) Where the hypocalcaemia is linked with a hypomagnesaemia the patient shows tetany of the fore end as well as the hind limbs, hyperaesthesia, and may become recumbent followed by a convulsion.

Inorganic Phosphorus.—The inorganic phosphorus has been studied in the later numbers of this series. The normal content is taken to be 4 to 6 mg. per 100 c.c. of serum. In general one finds a lowered inorganic phosphorus in the majority of cases showing tetany or having passed through tetany to coma or convulsions. The association of low inorganic phosphorus with hypocalcaemia is particularly pronounced.

Blood Sugar.—The sugar content of the blood has a common normal physiological range of 45 to 75 mg. per 100 c.c. in female bovines. The blood sugar is raised in those cases exhibiting struggling and disturbance of the emotional state, either reeling, paddling or preconvulsive. One may find a hyperglycaemia linked with hypocalcaemia and any one of the magnesium values, but in general the blood sugar range is higher in the hypomagnesaemic cases, *viz.*, 45 to 216.

Acetone.—In the latter half of this series total acetone bodies of serum were determined, the range being from 0 to 88 mg. per cent. It has been taken that where the biochemical analysis indicated a value lower than 5 no pathological significance is to be attached thereto. Values from 5 to 15 are considered as "mild acetonaemia," values from 15 upwards are considered as "severe acetonaemia." Where acetonaemia occurs at the parturition-puerperium period it is commonly associated with hypocalcaemia, hypermagnesaemia and variable blood sugar. Although acetonaemia associated with hypocalcaemia does occur without pronounced alteration of the magnesium level, a concurrent hypermagnesaemia is more common than a hypomagnesaemia in milk fever. Therapy designed to correct milk fever in former years must have cleared away the acetonaemia in the majority of cases. Where recovery is delayed in more modern treatment one should suspect acetonaemia and carry out the clinical tests as outlined by Udall.[2] It may be that a more or less transient acetonaemia, as yet not correlated with any independent clinical features, is a not uncommon accompaniment of parturition and puerperium. If this acetonaemia persists through the interregnum and becomes intensified in the early anoestrus an independent syndrome may appear, usually associated with a definite hypoglycaemia and a hypomagnesaemia. Acetonaemia is here treated as being a condition of the blood rather than a disease *sui generis*.

The Pregnancy Toxaemias

The toxaemias of pregnancy are a repetition of those shown in the puerperium with the raised or lowered values of all the plasma constituents discussed never quite so pronounced. One therefore encounters the syndromes:—

(*a*) Reeling, paresis, narcosis with the combination hypocalcaemia, hypermagnesaemia, hyper- or hypoglycaemia with or without acetonaemia.

(*b*) Paddling, paresis, coma taking a hypocalcaemia, normal magnesium, hyper- or hypoglycaemia.

(*c*) Hyperaesthesia, tetany, convulsions taking hypocalcaemia, hypomagnesaemia, hyperglycaemia.

The Interregnum

The interregnum postulated to show that in this series there is a break in the incidence of cases, or at least an absence of the onset of symptoms, coincides with the period of maximum bloom in the normal individual. This might be taken to indicate that the blood plasma changes associated with parturition have been completed during the puerperium of four days. Godden and Allcroft[3] have shown that even at normal calvings changes occur in the level of blood minerals which return to normal in a few days.

The Anoestrus, Oestrus and Dioestrus

Coincident with the onset of anoestrus, eight days following parturition, the class of case changes and there is almost a certainty of finding on biochemical analysis a lowered serum magnesium value, no matter whether the symptoms are those of acetonaemia, either the licking mania type described by Udall,[4] or the anorexia acetone breath type, or those of hypomagnesaemic tetany and convulsions described by Sjollema[5] as grass tetany or others as lactation tetany. Early in the anoestrous period the cases of mild acetonaemia showing partial anorexia and acetone in the expired air have the linking subnormal calcium, subnormal magnesium, hypoglycaemia, acetonaemia. An important feature with therapeutic indications is the low blood sugar coincident with the acetone bodies. It suggests sugar therapy; insulin would be contraindicated unless associated with injections of massive doses of glucose to raise the blood sugar. The cases of lactation tetany or grass tetany occurring during the anoestrus—oestrus—dioestrus period show subnormal calcium, very pronounced hypomagnesaemia, hyperglycaemia and general freedom from acetonaemia.

Haemoglobin.—The haemoglobin content has been noted during the latter part of this series, the normal range being taken as 10 to 14 grm. per 100 c.c. No values which would indicate definite anaemia have been found.

Clinical Expression

The scope of this work being entirely clinical, search was made for any one symptom or combination of symptoms which could be correlated with the biochemical findings and which would throw light upon the condition of the patient's blood plasma at the time of the clinical examination. An attempt was made to investigate the dictum that "The patient's behaviour is governed by the condition of the plasma contents." Early in this work the reeling—paresis—narcosis syndrome became apparent and the linking hypocalcaemia, hypermagnesaemia was found to be so constant in this type of case that one had only to be cognisant of the fact and sufficiently observant to assay a fairly accurate clinical estimation of the subsequent biochemical analysis. In this syndrome the reeling is evidenced by a disinclination to walk and if stimulated to do so the feet are only slightly elevated from the ground, the patient reels, flounders, makes efforts to regain the upright position, finally abandons the effort and becomes recumbent with all four legs tucked under the body. As the toxaemia progresses narcosis supervenes and a definite kink in the neck deflects the head to one side or the other. During this sequence the pupil of the eye is early contracted, later dilated but some response is obtained to the electric torch. The respirations are at first accelerated but balanced, later there is some slowing down and an expiratory moan is preceded by an inspiratory sigh. There is some definite response to needle puncture of the skin either for blood sampling or the introduction of therapeutic solutions. At the outset there is complete anorexia, inactivity of the alimentary canal and suppression of urine. The temperature curve shows at the onset slight elevation, then a gradual fall through normal to subnormal. Early on, the anal sphincter is contracted and later with the onset of narcosis may be relaxed.

On further clinical observation another syndrome was detected, namely, paddling tetany of the hind limbs (hypocalcaemic tetany of the precoma type), paresis and coma. It was found that the linking of hypocalcaemia with normal magnesium was fairly constant for this type. At the outset the patient paddles with the hind legs and, in contradistinction to the former syndrome, the feet are continuously elevated. The muscles of the hind limbs go into a tetanic spasm, so much so as almost to eliminate the normal joint angles, the hind leg is straightened and if the animal is made to walk the gait is stilted. During this early exciting stage the cow goes down in a more

orderly manner and may regain the upright position on several occasions, finally to become recumbent, unable to rise. The pupil of the eye is dilated, the anal sphincter contracted, faeces are in abeyance and the urine suppressed. The respirations are accelerated, later there is a slowing down and as the patient reaches the precoma there is a distinct expiratory groan. Whilst recumbent the hind legs are still extended and some difficulty is occasioned in keeping the patient in an upright sitting position, and turning the patient from one side to the other around the long axis with the legs under the body, is accomplished with difficulty. Bloating of the rumen is not uncommon and finally the patient goes down broadside absolutely unable to regain the upright sitting position, and coma supervenes with anaesthesia of the cornea, dilation of the pupils and no reaction to the electric torch. The temperature during the progress of this syndrome is only slightly elevated, then gradually passing through normal to distinctly subnormal, as low as 94° F.

The third syndrome, namely, hyperaesthesia —tetany of the preconvulsive type—paresis—convulsions and finally coma was also found to have a distinct clinical biochemical linking of hypocalcaemia with much more pronounced hypomagnesaemia. The onset of this sequence may be eclamptic, that is, coming into evidence in a flash, with great excitement, tetany of the muscles of the neck causing the head to be held high, fibrillation of the eyelids on approach with finger and thumb, fear and rage, greatly accelerated and steaming respirations, high temperature. A slight stimulus may precipate a crash to the ground, the onset of a convulsion and, if not arrested, death. Trismus sometimes sets in before a convulsion.

One encounters all kinds of intervening magnesium values linked up with the hypocalcaemias and there is a gradual merging of one syndrome into the other, but in the main the behaviour is so clean cut as to enable the experienced clinician to differentiate and to make an accurate clinical estimation of the calcium and magnesium values. Somewhere round about 5·5 mg. of calcium paresis supervenes. The normal range of magnesium values takes with it paddling; the higher range narcosis; and the lower range tetany of the preconvulsive type. The blood sugar values linked with each of these distinct entities can be estimated with considerable confidence.

Yearly Incidence

Not one year is like its predecessor. It has been observed that in any one year the month of June seems to be the crucial time in Hereford. When weather conditions are adverse in this month not only is there a high incidence of cases during the month but each succeeding month also carries a larger number of cases than usual, and the position is not rectified until the coming of a more favourable midsummer. The type of case is also subject to the conditions prevailing in June. In 1935 June weather conditions were favourable, in 1936 unfavourable and in 1937 favourable.

The basic diet of all bovines is grass and its products hay and dried grass. A study of the biological value of the proteins of fresh and dried grass has been made by Morris[6] and it would seem that in the spring and early summer the biological value of the proteins in these food products is at its maximum, namely, 75 to 80 per cent. Grass goes to seed in June and there is a translocation of reserve materials from the plant to the seed, and a lowering of the feeding value of the remaining vegetative parts. In an unfavourable June grass is allowed to go to seed before being made into hay, the biological value of the natural grazing in July and August is lowered and the hay which forms the supplementary ration in the succeeding winter is also of a lower value. Autumn grass has a biological protein value of 60 to 65 per cent. and winter grass may be presumed to be still less nutritious. Although no definite proof is available it would seem at least possible that increased incidence of metabolic disorders may be associated with poorer nutrition.

Monthly Incidence

January, February and March carry a moderate number of cases; April shows a steep increase which reaches a peak in May; a decline follows through July and August to September which carries the minimum in the present observations. Thereafter October, November and December show a slight increase up to the January figures. The serum magnesium values of the cases tend to follow the seasonal variations in biological value of grass proteins as described by Morris, and although this association may be accidental there is at least the suggestion that hypomagnesaemic conditions are linked with some quality in the grass. In July and August blood magnesium values seem to be at their highest and when cases of hypocalcaemia occur they tend to be associated with hypermagnesaemia, and sometimes with acetonaemia, but not with hypomagnesaemia. In late autumn the serum magnesium values again tend to fall. This occurs again during the period of rapidly growing grass in April. A late summer seems to predispose to low blood magnesium and a bad June should warn the clinician to keep a look out for the occurrence of hypomagnesaemia in any cases of metabolic disorder from October onwards. With these observations in mind a

particular grazing beef herd in the winter of 1936-37 was supplied with a supplement of ensilage made from June cut crops and no further cases of hypomagnesaemic tetany of the convulsive type occurred. Following the observations by J. Stewart[7] that a magnesium supplement tended to prevent a falling serum magnesium level, cubes of protein-rich cake enriched with magnesium oxide were fed to another herd at grass during April and May, 1937. Prior to feeding the cubes two cases of hypomagnesaemic tetany had occurred and the general level of blood magnesium in the clinically healthy cows was low. No further cases occurred and the general level of blood magnesium rose over the ensuing months. This may have been coincidence but the association is at least suggestive.

Therapeutics

The success of substitution therapy in cases treated early after the onset of symptoms is well established. Since 1935 calcium boro-gluconate solution (Hayden[8]) brought to blood heat and injected subcutaneously has been used for calcium substitution. A 25 per cent. solution of magnesium sulphate brought to blood heat and injected subcutaneously has been used for magnesium substitution. The glucose benzoic acid solution (Hayden[8]) brought to blood heat and injected subcutaneously has been used in acetonaemia cases. Small doses of potassium bromide and chloral hydrate following glucose therapy have been used with success for acetonaemia in the anoestrus. More recently the double iodide of mercury and potassium following glucose has given satisfactory results. In milk fever cases in this series calcium boro-gluconate solution was used primarily and where there was no response in four hours' stimulation therapy, inflation of the udder and ol. camphor injected subcutaneously, was resorted to. The impression still remains that for selected cases, those of coma preceded by tetany of the precoma type and in all cases where the temperature is markedly subnormal, stimulation therapy is the therapy of choice.

The subcutaneous injection of a 25 per cent. solution of magnesium sulphate seems to be the therapeutic find of the last few years. As an adjunct to calcium boro-gluconate solution or inflation, and injected at an independent site, it hastens the restoration to normal in the mixed hypocalcaemia-hypomagnesaemias, and is often the deciding factor in recovery where the hypomagnesaemia is pronounced. Injections of 200 c.c. may be repeated at short intervals with impunity in all cases of hypomagnesaemia tetany wherever occurring in the life history of the patient. The licking mania type of case carrying acetonaemia responds at once to magnesium therapy.

Summary

Three hundred cases drawn from the metabolic disorders comprising milk fever, acetonaemia, grass tetany, lactation tetany, transit tetany and pregnancy toxaemias in female bovines have been studied from the clinical, biochemical and statistical aspects. It is suggested that since the incidence is confined to the female, the recurring physiological crises of the female are primarily responsible. An attempt is made to classify the syndromes occurring in the period of the life history commencing with parturition and puerperium, anoestrus, oestrus, dioestrus and finally pregnancy. Milk fever is seen to be a much more complicated disease than a simple hypocalcaemia and many variants are discussed together with the indications for a clinical estimation of the state of the patient's blood plasma. It is suggested that the magnesium content of the plasma throughout the following twelve months is consequent upon the climatic conditions prevailing in June in any one year. Indications are given for the prevention of hypomagnesaemic tetany and satisfactory therapy is outlined for all these disorders.

References

[1]Allcroft and Green. (1934.) *Biochem. J.* **28.** 2220.
[2]Udall. (1933.) "Practice of Veterinary Medicine." Edit. I. 139-140.
[3]Godden and Allcroft. (1932.) *Biochem. J.* **26.** 1640.
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[4]Udall. (1933.) "Practice of Veterinary Medicine." Edit. I. 139.
[5]Sjollema. *Nutrit. Abstr. and Rev.* **1.** 4, 621 *et seq.*
[6]Morris. *Ibid.* **6.** 2, 273 *et seq.*
[7]Stewart, J., Blakemore and Stewart. Report Dir. Univ. Cambridge, Inst. Anim. Pathol. 1934-1935.
[8]Hayden. (1936.) *Cornell Vet.* No. 2. 157.

(*For Appendix see top of next page*)

GRADED MILK PROGRESS IN SCOTLAND

During the month of March nearly 300 herds were added to the "graded milk" list in the Scottish Milk Marketing Board's area, the largest increase being in Standard Certificates, in which class 174 new licences were issued, bringing the total to 1,071.

The number of certificates of attestation in force rose by 49 to 1,131, and there were granted 58 new licences for production of certified and tuberculin-tested milk, making the total in this class 1,460.

Altogether, 3,662 producers in the scheme area now hold graded licences in one class or another. Their production in February amounted to 3,339,000 gallons out of 7,695,000, the scheme turnover for the month.

The Board states that total production for March was 10,017,000 gallons. This was 136,000 more than in the same month of last year. Of the total turnover, 6,711,000 gallons, 67 per cent., was taken up by the liquid market.

APPENDIX: J. R. BARKER

PERIODIC CLASSIFICATION OF THE TOXAEMIAS OF THE FEMALE BOVINE

Period	*Calcium* 10·3	*Magnesium* 2·3	*Blood Sugar* 50—75	*Acetone*	*Clinical expression*	*Nomenclature*	*Treatment in order of preference*
Parturition few hours	4	(a) 3·3	33—135	0—30·6	Reeling paresis narcosis	Milk fever and acetonaemia	Borogluconate sol s/c or inflation. Glucose. sol. s/c. NaCl and treacle
		(b) 2·3	38—116	0—36·8	Paddling paresis coma	Milk fever and acetonaemia	Inflation or borogluconate sol. s/c.
Puerperium 4 days		(c) 0·8	45—216	31·0—0	Tetany paresis convulsions and coma	Grass tetany or lactation tetany	$MgSO_4$ sol. s/c. and inflation or borogluconate sol. s/c.
Interregnum 4 days				No cases originate			
	8·5	2·0	38	29·2	Licking mania	Acetonaemia	$MgSO_4$ sol. s/c NaCl and treacle
Anoestrus 1—6 weeks	8·4	1·3	38	13·6	Partial anorexia	Acetonaemia	Glucose sol. s/c NaCl and treacle ; small doses of chloral hydrate and KBr. Iodine and glucose *per os*
	9·2	1·9	29	88·1	Acetone breath		
Oestrus a few hours	subnormal	0·5	52—125	0	Tetany paresis convulsions	Lactation tetany or grass tetany	$MgSO_4$ sol. s/c NaCl and treacle ; chloral hydrate and KBr to follow
Dioestrus 21 days	6—8						
Pregnancy 280 days	subnormal 4—7	(a) above normal		0—34·6	Reeling paresis narcosis	Atypical milk fever	Borogluconate sol.s/c. or inflation
		(b) normal			Paddling paresis coma	Milk fever during pregnancy	Inflation or borogluconate sol. s/c
		(c) low	105	0	Tetany paresis convulsions	Grass tetany or lactation tetany	$MgSO_4$ sol. s/c and borogluconate sol. s/c or inflation NaCl and treacle

LIQUID PARAFFIN AND CAROTENE ABSORPTION

"Twelve years ago Burrows and Farr[1] showed that rats were unable to utilise the vitamin A of butter fat when it was mixed with liquid paraffin," states a recent *Lancet* annotation, which continues: "Later workers found on the other hand that liquid paraffin had no effect on the utilisation of the vitamin A of cod-liver oil. The significance of this difference was not explained until Moore[2] in 1929 differentiated between vitamin A and its precursor carotene, and subsequent animal experiments have made it clear that whereas the absorption of carotene is seriously interfered with by the presence of liquid paraffin in the alimentary tract that of vitamin A itself is not. These observations have now been carried a step further by Curtis and Kline,[3] who have studied the effect of the administration of liquid paraffin on the blood-carotene in human beings. They first showed that in people taking a low-carotene diet the blood-carotene fell steadily when crystalline carotene dissolved in cotton-seed oil was given mixed with liquid paraffin, but rose rapidly when the carotene solution was given alone. They next gave their patients a high-carotene diet and found that when 20 c.cm. of liquid paraffin was taken before meals the blood-carotene remained at a constant level, whereas it at once began to rise when the liquid paraffin was omitted. A daily dose of 30 c.cm. of paraffin given at bedtime, however, when there was no likelihood of it becoming mixed with food, had little if any effect on carotene absorption. Curtis and Kline point out that their results apply only to carotene and not to vitamin A as such, but nevertheless their findings are an argument against the common practice of prescribing paraffin at meal-times, when many think it acts best as a laxative and is less liable to leak."

[1]BURROWS, M. R., and FARR, W. K. *Proc. Soc. exp. Biol.* 1927. 24. 719.

[2]MOORE, T. *Biochem. J.* 23. 803.

[3]CURTIS, A. C., and KLINE, E. M. *Arch. intern. Med.* January, 1939. p. 54.

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Probably the only place in Great Britain where sheep eat seaweed instead of grass is North Ronaldshay, Orkney, where they are regularly turned out to "pasture" on the sea shore. The sheep seem to thrive on this unusual diet, while their mutton, which tastes slightly of iodine, is said to be of excellent quality.—*Farming News.*

Some Observations on the Causes of Infertility in Horse Breeding*

F. T. DAY, M.R.C.V.S.,
School of Agriculture, Cambridge

Under different systems of management, the percentage fertility of different groups of horses varies considerably :—

Heavy horses (Shires, Clydesdales and Suffolks) ..	59 per cent.
Light horses (Premium Stallions)	52 per cent.
Thoroughbreds at stud ..	68 per cent.
Ponies running wild	95 per cent.

Permanent and temporary sterility causes 30 to 45 per cent. of barrenness in all horses bred in this country except wild ponies. As these figures are averages obtained from statistics of a large number of stallions, and since in estimating the average great differences are seen in individual stallions, it is obvious that both the mare and stallion play a part in contributing to this large percentage infertility, but the mare is more often the cause, so that conditions which influence fertility in the mare will be considered first.

Before discussing clinical abnormalities of mares, it will be better to outline the normal physiology of reproduction in the mare, and see how conditions of management influence fertility in the normal mare.

The length and frequency of oestrus and time of ovulation.—While some mares continue to come in oestrus throughout the year, others go into an anoestrus condition in winter and do not come in oestrus from November to February.

The average duration of oestrus is six days, but it may vary from three to 65 days. In a cold dry spring, particularly in maiden mares, and in barren mares in rather poor condition, oestrus tends to last longer—10 to 20 days.

During oestrus a follicle matures in the ovary, commencing with a size of 1 to 3·5 cm. on the first day of oestrus and ripening to a size of 3·5 to 6·5 cm. before ovulation. The length of oestrus depends on the rate of development of the follicle to ovulation size. After ovulation the mare only remains in season for a little more or a little less than 24 hours (Hammond, 1938). Examination of a number of mares throughout the oestrous cycle confirms this, although one or two exceptions are found where mares remain in oestrus for several days after ovulation.

Most of the mares having long oestrus periods in the beginning of the year return to a normal cycle as the season advances and by May will be having four to six day oestrous periods.

After parturition the mare comes in oestrus in five to seven days, although variations of seven to 80 days are seen.

The dioestrus period, that is the time between the last day of one oestrus and the first of the next, is usually 14 to 18 days, but may vary from four to 83 days. Dioestrous periods of under 13 days follow oestrous periods in which ovulation did not take place.

Time of Mating and resulting Fertility.—As the spermatozoa from the stallion do not live very long in the genital tract of the mare, it is necessary that the mare should be mated close to the time of ovulation, if good results are to be obtained.

Hammond (1938) found that the highest percentage fertility, *viz*, 67 per cent., occurred from matings on the second day before the end of oestrus, and that it became gradually lower as the mating was made earlier in oestrus, or on the last day (*i.e.*, after ovulation).

Kedrov (1938) found that mares inseminated 15 to 24 hours before ovulation showed 66 per cent. fertility, two to eight hours before ovulation, 68 per cent. fertility, while two matings during this time resulted in 71 per cent. fertility. Insemination earlier than 48 hours before ovulation gave unsatisfactory results.

This is probably the reason why the travelling stallion, which is mated with mares when he visits the farms, irrespective of the phase of oestrus, has a lower percentage fertility (59 per cent. to 52 per cent.) than the thoroughbred stallion at stud, covering the mares two or three times on alternate days during oestrus, which have an average fertility of 68 per cent.

Ponies running wild, free to mate at any time, and as often as the mare will accept the stallion, have an even higher percentage fertility of 95 per cent.

Trying and Covering.—Where possible, regular "trying" of mares should be carried out to determine the oestrous cycle of the mare, and if charts were kept, showing oestrus, dioestrus and service dates, it would be easier to anticipate the appropriate time for mating, few oestrous periods would be missed, and the information would be very useful in making a diagnosis of the cause of sterility in barren mares.

Mares should be tried, if this is practicable, three times a week, until they come in oestrus, and every other day until they go "off," after which they could be turned away for 14 days, then tried again three times a week.

Causes of Temporary and Permanent Sterility in the Mare

In order to give a rough idea of the comparative incidence of permanent and temporary sterility in the mare, percentages are given of different conditions found on examination and

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subsequent history of 111 mares, whose detailed history was known. Most of the mares included in these figures were mares barren for two to five years and the percentages of various abnormal conditions are not representative of the yearly infertility of 30 to 40 per cent. but are given to show the comparative incidence of abnormal conditions in a group of mares with bad breeding records.

		Per cent.
Group 1.	Ovarian dysfunction ..	46
2.	Abnormal conditions of other parts of the reproductive tract	27
3.	Normal mares	27

These groups may then be split up :—

Group 1.	(*a*) Mares with cystic ovaries ..	38
	(*b*) Mares without cystic ovaries but having irregular oestrous cycles	62
Group 2.	(*a*) Mares aspirating air through the vulva, either due to trauma at previous parturition or to the shape and conformation of vulva in relation to floor of pelvis..	63
	(*b*) Mares with subinvolution of the uterus following difficult parturition, retained placenta or slipped foal ..	14
	(*c*) Mares with condition analogous to pyometra due to adhesions of the cervix holding up the secretions of the uterus and resulting in an accumulation of pus ..	4
	(*d*) Mares with a discharge of the reproductive tract commonly called " whites " (leucorrhoea) which in all cases has been associated with cystic ovaries ..	12
	(*e*) Mares with a slight discharge of the reproductive tract in which none of the previous conditions existed. (Probably due to the fact that ovulation had not occurred for a long time, and is a result of abnormal ovarian secretions) ..	5

In a group of 18 mares examined in the 14-day interval following parturition, all of which had foaled and cleansed normally, 14 mares made a normal recovery of the genital tract, and four did not.

Mares recovered normally	82
Mares in which involution of the uterus was delayed	18

Group 3.—This group consisted of maiden, barren and foaling mares which on examination and subsequent reports of their oestrous cycle were quite normal.

From these figures it appears that the main cause of permanent sterility is aspiration of air through the vulva, and of temporary or yearly infertility, cystic ovaries, irregularities of the oestrous cycle, mares with subinvolution of the uterus, and the almost identical condition of mares which foal normally, but do not make a complete recovery of the genital tract in the short interval following parturition.

Irregularities of the Oestrous Cycle.—Including the mares already mentioned, which remain in oestrus 40 to 60 days, about 15 to 20 per cent. of mares do not have a normal oestrous cycle throughout the year. Some mares remaining in oestrus 40 to 60 days eventually ovulate, or follicles regress and they go " off " and afterwards return to a normal cycle, but in some, the follicles persist, degenerate and become cystic.

Another group of mares come into oestrus once and although they do not conceive, fail to come in oestrus again. These are usually foaling mares which come on at the foal heat, and it is suggested that heavy lactation is responsible for them not coming in oestrus again. Maiden and barren mares may also behave in this way, coming into oestrus in early spring and then remaining " off."

A smaller proportion of maiden, barren and foaling mares fail to come into oestrus throughout the season, and some mares although showing oestrus regularly, will not " show " to the stallion or teaser, although they will " show " in the paddock to other mares.

In mares not coming in oestrus there are no palpable follicles in the ovaries unless they are mares with cystic ovaries, or mares which are ovulating without showing any signs of oestrus. It has been found in a few mares that ovulation may take place without oestrus, and oestrus without ovulation.

All these irregularities of the oestrous cycle contribute largely to the yearly infertility, which in many cases is seasonal, the same mares behaving normally one year and abnormally the next.

Cystic Ovaries.—Mares with cystic ovaries may be divided into two groups according to their oestrous cycle: mares which do not come in oestrus, or mares continually in oestrus or having long irregular oestrous periods. The former are mares usually having one or two large cysts, and the latter multiple small cysts.

Cysts cannot be distinguished from follicles by rectal palpation and examination, unless the exact time in the oestrous cycle at which the examination is made is known, and for these cases it is a great help in confirming the diagnosis if breeders have kept careful records of the oestrous cycle.

Just before oestrus or early in oestrus in a normal mare, several follicles may be palpated, varying in size from 1·5 to 3·5 cm. Normally one of these follicles matures to ovulation size, 3·5 to 6·5 cm., and as this increases in size, the other follicles regress. After ovulation and the formation of the corpus luteum no follicles over 1 to 1·5 cm. can be palpated for an interval of seven or eight days, so that it is in the seven days after oestrus, that one should examine mares to see if they have cystic ovaries.

Cysts will vary in size and number and while present fresh follicles will come up and go down without ovulating, but the original cysts remain constant and are palpable at any time in the cycle.

In several mares with cystic ovaries followed through winter, about half went into anoestrus and the cysts disappeared, whereas in the others they persisted.

Treatment of Cystic Ovaries.—A number of mares have been treated by puncturing the cyst. This operation is carried out with the mare in the standing position by holding the ovary in one hand per rectum and introducing a trochar into the vagina with the other.

In some mares the normal oestrous cycle has been restored and pregnancy has followed, but in most cases the mares come in oestrus again, follicles mature in the ovaries, do not ovulate, but persist and become cystic again. Puncturing a second time was successful in one mare and in another mare the intravenous injection of 1,000 units of Physostab (pregnancy urine extract) on the third day of the oestrus following puncture of the cyst, resulted in the mare becoming pregnant to a service on the same day.

Further work is being done in the treatment of these cases and the latter procedure is one which may bring good results.

Conditions preventing ejaculation of Sperm into the Uterus.—Normally if the mare is mated at the appropriate time in oestrus, when the cervix is fully dilated, the sperm is ejaculated into the uterus.

If from some cause or other this is prevented, the chances of fertility are considerably decreased.

During oestrus the cervix relaxes as the follicle matures in size, and is only fully dilated just prior to ovulation, so that service early in oestrus will result in ejaculation into the vagina.

Mares often strain immediately after service and evacuate the semen, particularly if they are not walked away and kept walking for a few minutes.

Abnormalities such as adhesions or a distorted cervical canal, also prevent ejaculation into the uterus.

In any of these conditions and in mares which are clinically normal but fail to stand to services at the right time in oestrus, artificial insemination should be employed. Good results have been obtained in these cases, but as one would expect, no good results have been obtained with mares with irregular oestrous cycles, or where any other abnormality is present.

Abnormal conditions of the Genital Tract.—Under this heading are included mares aspirating air through the vulva, mares with subinvolution of the uterus, and mares with a uterine leucorrhoea. When these mares are examined with a vaginal speculum, the clinical picture shows varying degrees of congestion of the vagina and cervix; the cervix is usually oedematous and flaccid and the exudate present will vary from a few frothy bubbles of mucin on the walls of the vagina to a seropurulent or flocculent discharge, and this will vary in quantity, being most marked in oestrus, while there is sometimes very little during dioestrus.

If the mares are aspirating air through the vulva, the vagina is overballooned, the cervix is displaced, and in long-standing cases there may be dilation of the cervix and ballooning of the uterus.

The mares in which normal involution of the uterus has not taken place usually show more marked inflammatory changes in the vagina, and the uterus can be palpated per rectum about four or five times thicker than the normal non-pregnant uterus.

Treatment

In mares aspirating air through the vulva, the operation of closing the upper commissure of the vulva as described by Caslick (1937) has proved very successful.

The upper half of the vulva is infiltrated with a local anaesthetic, the mucous membrane is then dissected to the depth of half an inch, the loose fold can either be removed or left, and the scarified surfaces of the lips of the vulva are brought together with two or three deep sutures. Between the deep sutures superficial sutures or clips are used to prevent the faeces penetrating the upper border of the wound.

The stitches are taken out on the sixth day when union has taken place, and recovery of the inflammatory condition of the genital tract usually takes three to six months.

Irrigation with various solutions has not given any results either with mares sucking air through the vulva or with mares with subinvolution of the uterus. An apparent improvement may take place due to the mechanical removal of the exudate present, but if treatment is discontinued, the mare returns to the original condition.

Mares with subinvolution of the uterus recover spontaneously in three to nine months if well fed and cared for.

In one mare with uterine lucorrhoea and with cystic ovaries, the discharge completely cleared up a few days after the ovarian cyst ovulated following the injection of 1,000 m.u. units of Physostab (pregnancy urine extract).

No.	Breed.	Age.	Service Behaviour.	Total Volume of Semen in c.c.	Volume of Sperm in c.c.	Volume of Seminal Fluid in c.c.	Number of Sperms c.c. (millions).	Total Number of Sperms (millions).	Motility of Sperms at time of collection.	Fertility in previous year or years.
1	Thoroughbred	11	Vigorous	52	52	—	66	3,432	60% good	88%
2	,,	11	,,	62	62	—	121	7,502	80% ,,	77%
3	,,	10	,,	79	42	37	150	6,300	90% ,,	68%
4	,,	16	Lethargic	30	30	—	41	1,230	50% fair	66%
5	,,	13	Vigorous	96	68	28	138	9,384	100% good	66%
6	,,	8	,,	105	68	37	45	3,260	80% ,,	63%
7	Percheron	16	,,	118	110	8	208	22,880	90% ,,	good 3 years ago
8	Thoroughbred	12	,,	50	35	15	61	2,135	60% fair	36%
9	,,	14	,,	94	94	—	141	13,254	80% good	14 to 50%
10	,,	26	,,	108	78	30	10	780	50% fair	33%
11	,,	10	,,	60	60	—	77	4,620	All dead	0%
12	Arab	13	,,	28	23	5	25	575	2% fair	0%
13	Percheron	14	,,	148	148	—	3	4,440	80% good	Not known
14	,,	4	,,	69	66	3	81	5,346	80% ,,	,,
15	Shire	10	,,	106	66	40	15	990	80% ,,	Good, but not known
16	Thoroughbred	16	,,	50	50	—	233	11,650	80% ,,	Not known
17	Percheron	3	,,	246	76	170	64	4,864	80% ,,	,,
18	,,	8	,,	294	192	102	30	5,760	70% ,,	,,
19	Suffolk	4	,,	180	80	100	85	7,000	80% ,,	,,

THE STALLION AND FERTILITY.—Examination of the records of stallions shows that some horses, although showing slight variation from year to year, have consistently high fertility records, 75 to 85 per cent., whereas several stallions over a similar number of years only get 35 to 50 per cent. of their mares in foal, and occasionally a horse is completely sterile.

These differences are probably due to the difference in numbers and activity of the spermatozoa in the semen.

In the stallion giving a good ejaculation of dense active sperm there will be a greater chance of a number of these sperms surviving in the genital tract of the mare, until ovulation occurs and fertilisation can take place, than in the stallion with comparatively few weakly motile sperm.

COLLECTION OF SPERM BY MEANS OF AN ARTIFICIAL VAGINA.—Over a hundred collections of sperm have been made from 20 different stallions. In some of these cases only one collection was made whereas in others up to 16 collections were made.

All these 20 stallions served into the artificial vagina normally, although two horses refused to serve on one of a number of occasions.

Four other stallions would not serve into the artificial vagina at all.

Of the 20 horses from which collections were made, ten were of known high fertility, and in the others the fertility was not known except for three horses of low fertility, and two were completely sterile.

The volumes of sperm were measured, density (number of sperms per c.c.) was estimated by sperm counts, and the activity of sperm at the time of the collection was noted.

In the two horses that were completely sterile, nearly all the spermatozoa were dead, but in the three horses of low fertility, the sperm collected was as good in numbers and activity as in the stallions of high fertility, but it is thought that with one of these stallions, unruly behaviour at the time of service was the cause of the trouble.

For interest, a table is given showing the average volumes and densities of sperm collected from 19 of these 20 stallions.

In most cases collections were made for artificial insemination, the results of which have already been mentioned.

Collections were made by using the Cambridge pattern artificial vagina, which consists of a metal cylinder, open at one end and tapered at the other. A rubber sleeve is inserted into the cylinder and doubled back at either end. The space between is then filled with water at 50° C. and the inner lining is lubricated with vaseline.

The stallion is then allowed to mount the mare in the usual way, and as he mounts, his penis is directed to one side, so that he serves into the artificial vagina, which is held alongside the mare.

In a short paper like this, it is impossible to go into any great detail of the many causes of infertility in horses, but it is hoped that sufficient has been said to stimulate a fertile discussion.

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Discussion

Mr. W. Gibson opened the discussion in the following terms: In the first place, I should like to thank Mr. Day for coming here to-day to read a paper which concerns us all to a large degree as we are constantly meeting with cases of sterility. I would also like to congratulate Mr. Day on his choice of a subject in which to specialise, as there is a great deal of work yet to be done materially to reduce the percentage of over 40 per cent. barrenness in the equine race. Mr. Day is lucky in that he deals with thoroughbreds where there is nearly always a more or less complete history of the individual animals. The paper he has given us to-day is, I know, rather limited by the facts that (*a*) it is a very big subject; (*b*) Mr. Day is giving a more complete paper at the annual Congress in Yarmouth this year, and from what we have heard to-day I am sure that we shall look forward eagerly to the publication of that paper.

From what the essayist has told us and from my own experience it appears that improvement of stud management will do a great deal to increase the fertility of both stallions and mares. I agree that regular trying of mares is particularly necessary but would suggest that it should be carried out three times a week during the whole of the mating season as I have found that many mares come in season again on the twelfth day after mating and that when covered then they invariably proved in foal.

It is very important to study the oestral cycle of each individual female and charts should be kept as there is much more chance of getting the mare in foal if she is served as near the time of ovulation as possible. It is difficult to estimate when this will happen, but it is much easier if charts are kept, so that the stud man has some idea when the mare will be going off and have her covered the day before.

I think it is necessary to have the mares in good bodily condition and turned out to grass—in fact, as near back to nature as possible—and that the stallions should also be in good condition, but not too fat, and should be fairly fit. Some of the mistakes commonly made in stud management which contribute to this low fertility rate are: mares in low bodily condition, breeding from mares which are too old, barren mares served too early in the year (I do not think that the craze for early foals helps the fertility rate, as mares are asked to produce foals at a time not decreed by nature), mares not tried often enough or teased too much at each trial, covering a mare in front of another mare that is apparently holding, running mares that have been covered at grass with geldings.

I think that one of the chief causes of temporary sterility in mares is over-working of the reproductive organs, as we are asking these organs to work practically twelve months in the year with only an eight-day interval in which to adjust themselves from getting rid of one foal to starting to produce another. I am sure some owners of mares would save themselves a lot of money and get better results if they rested their mares every third or fourth year.

On looking through the stud book it is very rare to find a mare that has produced three or more living foals in succession. I feel that this over-working of the genital organs is responsible for a great many of the mares reported as barren, slipped foal, foal born dead, etc.

It seems rather strange that only 27 per cent. of 111 mares examined were reported normal. I quite agree that ovarian cysts are the chief causes of permanent sterility and think that it is closely followed by infection of the uterus; and that temporary sterility is chiefly due to failure of the uterus to make a speedy enough recovery from the function of carrying and delivering a foal. Many of the cysts in the ovary can be ruptured by massage *per rectum*, but possibly these are over-grown follicles that have failed to rupture normally. I have found that when it is done early enough most mares return to a normal oestral cycle and many prove in foal if covered immediately after the operation. I would also advise the examination of the ovaries *per rectum* of any mares that have been in season for longer than six days. I have had no experience of rupturing the cyst by means of the trochar, but it sounds most useful in those cases where you cannot rupture the cyst by massage, and incidentally it might be a very useful treatment for the vicious mare.

The ballooning of the vagina is a very common cause, (1) by preventing the ejaculation of the semen within the *os*, which is usually displaced in this condition; (2) a ballooned vagina is nearly always an infected one, the mucous membrane is oedematous and there is always present some amount of inflammatory exudate. I have had good results in these cases by saline irrigation, direct ultra violet ray treatment and artificial insemination (I shall certainly try the operation of closing the upper commissure of the vulva; it sounds most hopeful for some cases).

I have never had any good results in those cases where mares aspirate air into the uterus, or where the uterus contains a thick muco-purulent material.

Has the essayist tried any glandular therapy? Prolan is most useful for bringing some animals into season; it appears to start a normal oestral cycle.

I am glad the essayist has introduced the stallion into his paper; the figures produced are very interesting, and there is very little I can say about this side of the question. It is, however, very necessary to know at an early date

whether the stallion is likely to be a good stock getter or not. It would be a good thing if the semen of all stallions was examined at the beginning of each season. I would also suggest that he adds to the statistics particular notes with reference to the management of the studs where the stallions are standing.

I appreciate the fact that Mr. Day could not go into many of the causes of sterility and their treatment in this paper. I would like to thank him once more for coming and giving us this most interesting paper and tell him that I am looking forward with great interest to his paper at the Yarmouth Congress.

Mr. H. H. Truman thanked Mr. Day for his paper and said the only criticism he had to make was that the hereditary factor had been omitted; and as a stud owner for many years he had no doubt that it played an important part. He said also that the stallion at work was the one that usually got the most foals. He thought that the ninth day after foaling was the best time for service.

Mr. J. H. Poles asked if retention of the placenta had much to do with sterility; and was it as easy to rupture a cyst in a mare as in a cow?

Mr. C. Weighton enquired of the essayist what part the nutritional factor played. He thought the cysts in the ovary were blamed for a lot; atrophy of the ovary was fairly common in the cow; was it so in the mare? Mares usually came into season on the ninth or tenth day after foaling. What was the best stain for spermatozoa?

Mr. G. A. Moore observed that ovarian cysts and endometritis were commonly co-existent; which was the primary disease? He commented that vitamins had not been mentioned in the paper.

Mr. W. W. Lang said he would like to add his quota of praise to that which all other speakers had given the paper and also to congratulate Mr. Day on taking up this subject—a difficult and an enormous one and of national importance. He hoped that he would get the pleasure of seeing some results from his work. Mr. Lang thought that the stallion was more often to blame than the mare, and that much sterility was due to the stallion only visiting mares each week. He also mentioned that mares fed on Fibrinogen meal came in season most fiercely and when the meal was dropped they did not come in season again.

Mr. R. Hudson asked: Does the stallion ejaculate into the uterus? If so, it was contrary to what happened in other animals. He had noticed that mares with a dilated *os* after service very rarely held. Urine had a tendency in some cases to run forward into the vagina. He asked for an explanation of the cases where a mare was sterile to a horse of its own kind yet bred straight away when mated with a stallion of another breed. He added that diseases of the ovary and uterus had not been a great source of trouble in his practice. He had attributed sterility more to: condition of the mares, interference with the mares by the groom, influence of the weather, stallions only visiting once a week, etc. Suckling mares often would not breed.

The Reply

Mr. Day thanked Mr. Gibson and all those who had contributed to the discussion for the way in which they had received his paper, and said that he would endeavour to reply to the points raised in the discussion.

Dealing first with Mr. Gibson's remark that mares covered twelve days after a previous service frequently became pregnant, it was an experience frequently mentioned by capable stud grooms that barren and maiden mares were often got in foal by a second or third service nine to twelve days after the previous mating, the explanation being that the mares were having long oestrous periods of ten to 15 days and the subsequent service nine to twelve days after the first, happened to coincide with the time of ovulation at the end of oestrus.

Mr. Gibson had remarked that it was difficult to judge the appropriate time for mating when the length of oestrus was unknown. This was true in the case of barren and maiden mares in the early spring, but by vaginal examination in these mares it was possible to find the pre-ovulation period by the appearance of the vagina and cervix. "In an oestrus period of ten days, during the first six to seven days," said Mr. Day, "the cervix is constricted or only slightly relaxed, but by the eighth or ninth day the cervix becomes fully relaxed and dilated, the external folds are oedematous, the vagina and cervix are congested and there is usually a slight amount of clear mucin lying on the floor of the vagina. From this clinical picture which can be confirmed by the palpation of a large follicle in one of the ovaries, it is possible to estimate that ovulation will occur within 48 hours."

Various speakers had brought up the question of the general condition of mares and stallions, and the part played by nutritional factors, including vitamins, in fertility. It was recognised in all animals that nutrition played an important part in maintaining maximum fertility. A good hard condition resulting from adequate feeding and exercise was the best for breeding animals. Excessive fatness was equally as undesirable as a poor unthrifty condition.

In thoroughbreds the percentage fertility had been consistently 66 to 68 per cent. for the last 20 years, and as the majority of these mares are kept under fairly natural conditions, being out at grass throughout their stud life, and under the management of men, in most cases with a life experience in the feeding and management of horses, it seemed improbable that much of the infertility was due to nutritional causes.

However, it had been noticed that mares having long or irregular oestrous periods were often mares in relatively poor condition, and when the mares had been on the young growing grass in spring and had improved in condition they usually returned to a normal oestrous cycle.

Mr. Day agreed with Mr. Gibson in his suggestion that barren mares should not be covered very early in the season. Many services of the stallion were wasted on these mares in the first six weeks of the season, when a number of them had long oestrous periods and the chances of covering them at the appropriate time in oestrus were very small, but if early foals were particularly wanted and the mares were not remaining in season too long, there was no reason why they should not be covered.

Mr. Gibson had mentioned that few mares had

more than three or four foals in successive years, and he thought it advisable to give mares a rest from breeding every three or four years. Mr. Day did not agree with this; if a mare foaled normally and was in good health and condition there did not appear to be any reason for missing the mare.

The same speaker had stated that infection was frequently a cause of sterility in the mare. It would appear that infection of the genital tract, metritis and vaginitis were synonymous terms used to define what appeared to be an inflammatory condition of the genital tract, usually associated with a discharge from the vulva.

This condition might result from a number of different causes—aspiration of air through the vulva, subinvolution of the uterus, and to a lesser extent was associated with cystic ovaries and irregularies of the oestrus cycle.

Mr. Moore asked if cystic ovaries were the result and not the cause of metritis. In mares aspirating air through the vulva and in mares where complete involution of the uterus had not taken place, both conditions in which the clinical picture would be described as metritis, the mare's ovaries and oestrous cycle were usually normal but in a number of cases where there was a leucorrhoea of the uterus it was associated with cystic ovaries or an irregular oestrous cycle. One case was mentioned in the paper of a mare with cystic ovaries having a similar condition, in which the discharge completely cleared up after a few days following ovulation of the cyst by injecting Physostab (pregnancy urine extract).

Mr. Gibson had also made reference to rupturing cysts with one hand in the rectum. It was very difficult to rupture follicles or cysts in the mare's ovaries, unless they were large enough for the lower border to be close to the ovulation fossa; in all cases it had been necessary to puncture cysts, but large ripe follicles could be ruptured quite easily by hand.

With reference to the use of hormone preparations, pregnancy urine extract, which was mainly luteinising in effect, if given in doses of 1,000 to 3,000 mouse units intravenously, had been found to cause ovulation of mature follicles in several mares in 30 to 60 hours, but it had not been possible to induce oestrus with this hormone.

Pregnant mare serum extract in doses of 2,000 mouse units in oil, given subcutaneously, appeared to induce oestrus in several mares during the breeding season, but failed to do so in the autumn and winter.

The preparations of the hormones used were Physostab and Antuitrin S (pregnancy urine extract) and Serogan and Antostab (pregnant mare serum extract).

In answer to Mr. Gibson's question about the management of the stallions mentioned in the paper, in all cases it was good.

The only other causes of sterility met with, besides those already mentioned, were instanced by two mares with immature non-functional genital organs, and two mares with a unilateral cystic condition of the Fallopian tubes. The latter were only recognised on *post-mortem* examination, but in a large number of *post-mortem* examinations these were the only cases showing any abnormality of the Fallopian tubes.

With regard to insufflation of the Fallopian tubes in the mare, this had been tried with several normal mares. When carbon dioxide gas was allowed to pass slowly into the uterus, it was found that it caused the mares considerable distress at pressures of 80 to 100 mm., and the only leakage of gas occurred back through the cervix.

A number of uteri collected at *post-mortem* examinations and placed in a bath of warm saline were subjected to the same treatment, and distended with gas up to pressures of 300 mm.; there was no escape of gas through the Fallopian tubes, and in one case the uterus burst. This negative result was quite understandable as the uterine entrance into the Fallopian tube, in the mare, unlike the human and other domestic animals, which had a simple opening, consisted of a small nodular protuberance which jutted into the uterus, so that pressure of gas tended to close rather than open the uterine end of the tube.

Various speakers had mentioned that they thought the stallion was more often to blame for infertility than the mare. In heavy horses, even more than thoroughbreds at stud, under the different methods of management, differences in the fertility of stallions were more pronounced.

There were instances of stallions which in successive years got 60 to 70 per cent. of their mares in foal, whereas with others only 40 to 50 per cent. fertility resulted. In thoroughbreds some horses consistently got 70 to 85 per cent. fertility, but the majority varied between 58 and 70 per cent., and a few had only 30 to 55 per cent.

From these figures it was evident that the stallion was equally important as the mare for maintaining maximum fertility in horses.

After retention of the afterbirth in mares, it was frequently found that complete involution of the uterus was delayed for several months, so that it was often the cause of a mare being barren for the year in which it happened.

Mr. Hudson had mentioned that after service by the stallion there was usually a considerable quantity of sperm in the vagina and that only occasionally was there no sperm at all, when he doubted if the horse had ejaculated. Owing to the large volume of ejaculate from the stallion, even when ejaculation took place directly into the uterus, a considerable quantity of sperm would run back into the vagina, and of course all the semen would not be ejaculated into the uterus. Horses frequently appeared to experience an orgasm, without ejaculating, and the only way of being sure that a horse ejaculated was to place the palm of one's hand against the base of the penis when the peristaltic waves could be felt as the sperm passed through the urethra.

With regard to mares with a widely dilated cervix not getting in foal, the normal dilatation of the cervix varies from the small finger in dioestrus to two or three fingers in oestrus. Except in mares at the foal heat, if the dilatation was greater than this it was invariably due to a long-standing condition of aspiration of air through the vulva.

Several speakers had said that the ninth day was the optimum date for service. With this he agreed: mares came in oestrus five to seven days after foaling, and the ninth day was usually towards the end of oestrus, close to the time of ovulation.

The Veterinary Record

May 6th, 1939.

The Poultry Industry Bill

IN the *Veterinary Record* of April 29th is published a full summary of the proposals contained in the Poultry Industry Bill, now before Parliament.

The Bill is the outcome of recommendations of the Reorganisation Commissions for Eggs and Poultry and the Poultry Technical Committee and has been awaited with much interest by the poultry industry and the veterinary profession. It will be recalled that the N.V.M.A., through its Advisory Committee on Poultry Diseases, submitted evidence to the above-mentioned bodies and discussed with them the subjects of poultry health and disease. Reference to the evidence prepared by the N.V.M.A. was made in the various reports.

The above-mentioned reports stressed the importance of the health and quality of poultry stocks and the enormous losses to the industry from the growing mortality due to diseases, especially of an apparently non-specific nature. The Poultry Technical Committee made recommendations for the carrying out of measures to effect an improvement and in the Bill are found many of their suggestions.

The Bill can, for convenience, be divided into two main parts dealing with (*a*) the health and quality of poultry stocks and (*b*) the marketing of eggs and poultry products, including imports. While it is mainly with the first part that we are concerned and while the consideration of the second part must be left largely to the industry itself, it is gratifying to note that provision is made in the Bill for the regulation of imports of poultry and poultry products, the grading of eggs and dead poultry (which will constitute a guarantee of quality) and for further steps to be taken concerning the marking of eggs, fresh and preserved, imported into the United Kingdom.

The administration of the proposals is to be in the hands of a Poultry Commission, consisting of a Chairman and not more than eight members who will be independent of the poultry industry. The appointments will be made by the Minister of Agriculture and the Secretary of State for Scotland. The functions of the Commission are to include the "keeping under general review of matters relating to the maintenance and improvement of the health and quality of poultry stocks and eggs for hatching. . . ." In order to assist the Commission in the carrying out of this part of its functions, there is to be established a Stock Improvement Advisory Committee (with sub-committees for England and Wales and for Scotland respectively) consisting of members representative of the various interests concerned together with four additional members to be appointed by the Ministers. The Committee will follow the general lines of the Advisory Committee set up under the Livestock Industry Act.

Three main proposals concerning stock improvement are contemplated:—

(*a*) the compulsory registration of distributors of poultry stock, hatching eggs and day-old chicks including dealers and hatchery-men. Inspections by agents of the Commission are to be carried out and eventually it is expected that regulations will be formulated setting out a minimum standard of health and quality of poultry stock to which distributors will have to conform. (In the first place "glaring malpractices" will receive attention.) Provision will be made for the removal of names from the register. For the expenses of the Commission, including the costs of inspection, it is estimated that £80,000 to £90,000 per annum will be required and this sum shall be borne by the Exchequer;

(*b*) the formation of an "accredited" scheme on a voluntary basis. The scheme will be designed to encourage breeders to produce breeding stock of high quality for distribution. It is stated that premiums on a diminishing scale over a period not exceeding seven years will be awarded to such breeders to recompense them for the extra labour involved in keeping records, etc., and, further, that they will probably receive certain free veterinary services (blood testing and *post-mortem* examinations) from the State Veterinary Service. It is hoped that this scheme will cause an improvement in the quality of stock and a lowering of mortality. The total sum recommended for this purpose is not to exceed £250,000 over the whole seven-year period. Hatcheries are included in the scheme but it is not proposed to pay premiums in their case;

(*c*) the encouragement of research in respect of any matter relating to the poultry industry. This subject is dealt with in the section named "Service Schemes." The Poultry Technical Committee recommended the establishing of a research station to investigate obscure causes of poultry mortality and reference was made to it by the Minister of Agriculture in the House of Commons in July last year. No mention is made of the research station in the Bill, but it is understood that proposals have been formulated and are now under discussion.

Details concerning the schemes are not referred to in the Bill: it will, evidently, be the duty of the Poultry Commission with the assistance and advice of the Stock Improvement Advisory Committee to prepare them. Nor is it clear how far the veterinary profession (other than the State Veterinary Service) is to be used in the proposed schemes. The N.V.M.A. has already stated its views on this aspect of the subject and has made representations to the Ministers concerned.

A further analysis of the proposed schemes with special reference to the part to be played by the veterinary profession will appear in next week's issue of the *Veterinary Record*.

* * * * *

Equine Sterility and Infertility

THE causes of infertility and sterility in horses have not hitherto received the attention from those who are responsible for financing and initiating research in Britain which their importance demands. An average percentage fertility of between 55 and 65 per cent. for breeding mares (excluding wild ponies) is a serious handicap to the horse-breeder, and to the country.

The Thoroughbred Breeders' Association, and to a less extent the Betting Control Board, are to be congratulated for the initiative they have displayed in having provided funds and facilities to the School of Agriculture at Cambridge whereby it was possible to appoint a veterinarian some two or three years ago to investigate the causes of sterility among mares. The paper we print elsewhere in this issue will indicate to our readers that the action taken by the two bodies mentioned is producing excellent results.

The practitioner in a horse-breeding district should welcome the information which has been made available by this work. An opportunity was provided which can seldom occur in ordinary practice, to examine mares at frequent intervals throughout the breeding season, and in some cases through the whole year. Frequent rectal and vaginal examinations, and close scrutiny of carefully-kept records of oestrus, provide the best data upon which an accurate diagnosis of the causes of sterility can be based. Moreover, very considerable personal skill and experience are required. In an ordinary practice, where the practitioner must keep himself up-to-date in many different lines of work, ability to treat sterility with confidence, can only come after long years of experience, and some of the conclusions arrived at in the paper mentioned, could hardly have been reached at all in practice. The work demands not one examination of a mare but many, and the busy practitioner has not the time, nor has the owner the money, to make these possible. Moreover, the work is of a specialist nature, and everyone cannot be a specialist.

It is interesting to speculate what the solution must be. In human medical practice, needs of this kind are met by a cadre of highly trained *ad hoc* specialists; but the veterinary profession can hardly be said to possess an equivalent cadre, even if we include teachers in the schools and research workers. Whether in course of time we shall achieve some system of local area hospitals, to each of which specialists will be attached, or whether we shall copy the system that functions apparently successfully in human medicine, remains to be seen.

The rôle of prophet is seldom safe and never advisable, but in view of present international confusion and complications, it would seem that it might be well to consider whether we might not do everything possible to assist or stimulate the breeding of horses. Many competent observers have pointed out that in a state of emergency it may yet be necessary to rely upon horse transport to reinforce civil if not military movements and distribution of goods and food. If, by the application of the results of research work such as that described, some raising of the levels of fertility in mares can be effected, it would do something towards providing a greater supply of horses should they be needed.

CLINICAL COMMUNICATION

Haematoma of the Udder

S. JENNINGS, M.R.C.V.S.,
KNOWLE, WARWICKSHIRE

Subject.—A well-bred Friesian cow that had calved her third calf one month previously. She was giving about five gallons per day.

History.—The animal appeared normal at morning milking but came in at afternoon milking with a huge swelling at the back of the udder. This was so large that the dung, when dropped, trickled over the surface of it.

Examination did not reveal any particular mark of the skin over the udder. The milk in three quarters contained a great deal of blood.

Diagnosis.—Haematoma of the udder. A doubtful prognosis was given.

Treatment consisted of cold water applications to the udder. The swelling increased during the next 24 hours. At the third day most of the blood had disappeared from the quarters and pure milk was given.

At the fourth day a longitudinal incision was made on the ventro-posterior surface of the udder in the mid-line. Approximately two gallons of blood were let out but large clots remained. The incision was then enlarged and a sterile hand was inserted to remove the clots. The cavity was found to extend forward and had separated the septum between the two halves of the udder. As the clots were removed the right hand was extended forward until finally the tips of the fingers could be felt by the left hand when placed in front of the udder; the two hands were separated only by one-eighth of an inch thickness of skin. The cavity was filled with pure glycerine and acriflavine 1 in 10,000. This was repeated several times at intervals of a few days until at the end of three weeks the cavity had filled up.

The interesting part of the case was that at no time did the cow give less than two gallons of milk a day and she was back to as much as four gallons per day long before the haematoma cavity had filled.

LIVESTOCK IN SCOTLAND

Scotland's sheep population last year rose to the highest figure on record. The Department of Agriculture's report for 1938 shows that the number increased by 451,600 over 1937 to a total of 7,969,500. There were increases also in the numbers of cattle, pigs and poultry, but farm horses were 2,666 down on the year. Cattle, at 1,315,000, were 25,000 up on the 1937 figure. Pigs, at 256,000, were little short of the record set up in 1935. All classes of poultry were more numerous than in the previous year. The total, 7,800,500, was 183,500 higher than in 1937.

ABSTRACTS

[Infertility in Male Domestic Animals. LAGERLÖF, N. (1938.) Paper to Thirteenth Int. Vet. Cong.]

This is an excellent account of the author's own researches on sterility, in which he draws attention to the hitherto unexpected frequency with which partial or complete sterility occurs in male animals. For example, out of 2,300 bulls discarded in Swedish bull societies 23 to 24 per cent. were eliminated on account of infertility in one form or another. Reduced fertility also occurs in stallions, goats, rams and boars, although it is of relatively less importance in these species.

Lagerlöf distinguishes three forms of infertility:—

(1) Entire cessation of sexual desire.

(2) Incapacity to copulate.

(3) Incapacity to fertilise.

The first two forms are easily recognisable. An interesting observation is that incapacity to copulate often results from inflammation of the ileo-sacral joint. This condition is related to bad feeding and rapid growth, whereby a relatively weak skeleton develops, which is unable to stand the strain when a young bull is put into hard service.

Incapacity to fertilise is caused by morbid changes or functional disturbances in the testicles, epididymis, seminal ducts or accessory sexual glands. Much information about the potential fertility of an animal can be obtained by an examination of the sperm. Thus the author has demonstrated by this means greatly reduced fertility or total sterility in 263 bulls, 32 stallions, 18 boars and six dogs.

The commonest morbid changes in the testicles which give rise to reduced or ceased capacity to fertilise are, according to the author's observations, as follows:—

(1) Testicular hypoplasia, about 25 per cent. of the cases.

(2) Degenerative changes in the seminal epithelium, about 41 per cent. of the cases.

(3) Fibrosis testis, about 12 per cent. of the cases.

(4) Inflammatory testicular changes, about 24 per cent. of the cases.

Testicular hypoplasia is comparatively common in young bulls and appears to be a hereditary condition in some breeds (*vide infra* —abstract of article by Eriksson). Various degrees of under-development are observed, and according to the degree of spermiogenesis in such testicles the animal is partially or totally sterile. In this condition the bulls have generally highly developed sexual desire, and in a clinical examination it may be difficult to state that the testicles are smaller than normal.

Degenerative processes in the testicle with atrophy of the seminal epithelium are probably the commonest cause of reduced or total sterility in males. Among the causes, Lagerlöf mentions fevers, chronic general diseases, intoxications, disturbances in nutrition, etc. Hormone disturbances possibly also are very important causes. Clinical diagnosis is based on an examination of the semen.

Fibrosis testis constitutes the final stage of general atrophy of the seminal epithelium. If extensive fibrosis exists the testicles feel harder than normal. The incised surface of the testicle is dry and yellowish-brown to dark-brown, and often shows numerous streaks. The epididymes are small and without any sperm contents.

Inflammatory changes of the testicles generally produce palpable clinical symptoms. The common cause in bulls is *Br. abortus*. In the author's opinion, cases of orchitis due to *Br. abortus* which do not show any clinical symptoms are relatively frequent. The testicular change is discovered often after a long period of infection by reason of reduced fertility, and it is often impossible to demonstrate the organism at this stage. In acute unilateral orchitis, the author has been able to save the function of the other testicle by surgical removal of the damaged testicle.

Morbid changes in the accessory sexual glands are generally due to infection of these organs with *Br. abortus* or streptococci. Diagnosis should be based on examination of glands *per rectum* and by bacteriological culture of the semen.

The treatment of infertility in male animals must be principally directed to prophylactic measures against the underlying causes.

N. J. S.

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[Pathological Changes in the Genital Organs of Cattle. Eriksson, K. (1938.) Paper to Thirteenth Int. Vet. Cong.]

Amongst the cattle in the mountainous regions of Sweden, sterility resulting from hypoplasia of the testicles in the bull and of the ovaries in cows is widespread and causes great losses to stockbreeders. The seat of the hypoplastic changes is the germinative tissue in the reproductive glands. The condition is commonly unilateral (in about one-quarter of the animals examined) and generally on the left side. Bilateral hypoplasia causing complete sterility was observed in 4 to 5 per cent. of the animals examined.

This type of hypoplasia has been shown to be hereditary, and in making an analysis of the method of transmission the author has found that two recessive factors are involved. Acting separately, each factor produces a unilateral hypoplasia, but when both factors are acting together in the same individual bilateral hypoplasia results. The frequency with which the two types of hypoplasia has been observed to occur, agrees with the frequency which can be calculated theoretically.

N. J. S.

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[Disorders of Reproduction. Götze, R. (1938.) Paper to Thirteenth Int. Vet. Cong.]

The prevention and treatment of sterility and other reproductive disorders in animals are of such importance to animal production that Götze visualises the necessity for State or public control of breeding establishments. The major causes of breeding troubles are to be found in bad methods of breeding and feeding, in the appearance of specific infectious diseases, and in sporadic diseases due to faulty hygiene. Sterility of hereditary origin would appear to be of comparatively minor importance in Germany. Bad management and improper feeding of animals, together with specific infections, are the major causes of functional sterility in animals. In regard to the former, attention should be directed to more rational feeding methods and to the improvement of pastures. These are the best means for combating sterility caused by deficiencies in hormones and vitamins, about which our knowledge is still inadequate. In the eradication of infectious diseases causing sterility, prevention represents the best means, and this entails progress in diagnosis, elimination of carrier animals, isolation measures, treatment of sick and suspected animals, and slaughter methods when necessary. The local treatment of affections of the ovaries, vagina, uterus and cervix, however, still has an important place in veterinary medicine.

N. J. S.

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[Shock Induced by the Sting of a Honey-Bee on a Dog. Kak, P. N. (1938.) *Ind. Vet. J.* **15.** 1. 59.]

A severe case of shock in a spaniel dog, following a bee sting on the cheek, is recorded.

Great swelling of the head, a temperature of 105° F., marked dyspnoea, and a staggering gait were the chief symptoms.

The treatment consisted of frequent fomentations, the application of liq. ammonia solution, and the administration of egg flip with brandy.

The temperature subsided in six hours, and recovery was complete in two days.

D. D. O.

REVIEW

[Special Pathology and Therapeutics of the Diseases of Domestic Animals. By Dr. Franz Hutyra, Dr. Joseph Marek, and Dr. Rudolph Manninger. Fourth English Edition. Edited by J. Russell Greig, Ph.D., M.R.C.V.S., F.R.S.E., with the collaboration of J. R. Mohler, V.M.D., D.Sc., and Adolph Eichhorn, D.V.S. Volumes I, II, and III. (Pp. 2,410; 724 figures, 23 plates. £6 6s.) London: Baillière, Tindall & Cox. 1938.]

Since its first appearance Hutyra and Marek has been accepted as the outstanding work dealing with the diseases of the domesticated animals and the new English edition will be welcomed as timely in view of the considerable advancement of knowledge which has occurred since the appearance of the third English edition. Manninger is now responsible for the part dealing with infectious diseases and Marek, as in previous editions, for that which deals with systemic diseases. The editor-in-chief, Professor Russell Greig, and the editors of the previous edition in English, Dr. J. R. Mohler and Dr. A. Eichhorn, have also added to (or revised) the text in a number of places in order to render it in closer accord with recent developments in their respective countries.

Far-reaching revision has been made throughout the volume devoted to infectious diseases and in a large part of that on systemic diseases; many chapters have been entirely rewritten. Amongst these may be mentioned the chapters on the gas-oedema infections, pasteurellosis, paratyphoid, swine-fever, Aujeszky's disease, fowl cholera, foot-and-mouth disease, brucellosis, septicaemia of the new-born, enzoötic pneumonia of young animals, canine distemper, malignant catarrh, rabies, tuberculosis, actinomycotic infections, piroplasmosis, trypanosomiasis and other tropical diseases, colic and digestive diseases, the avitaminoses, osteomalacia, rickets and acetonaemia. New chapters which have been inserted include fowl-typhoid, feline infections, gastro-enteritis, Newcastle disease, vesicular stomatitis, trichomonas abortion of cows, Rift valley fever, blue-tongue and other tropical diseases, botulism, infectious bronchitis and broncho-pneumonia of horses and of cattle, swine influenza, enzoötic myoglobinuria of horses, enzoötic encephalomyelitis in various species, osteodytrophia fibrosa and "the anxiety psychosis" of dogs. Extensive and valuable additions on diseases due to animal parasites are also made.

According to the authors' foreword, they have tried to meet the needs both of research workers in the field of comparative pathology, and of practising veterinarians. The value of their work to the research worker is very considerably reduced by the absence of any detailed references to original articles, though names (by no means always spelt correctly) are freely used. It is for the practising veterinarian and for the post-graduate worker who wishes to increase his general knowledge of veterinary medicine over a wide field that it will have its greatest value. These readers may not require detailed references, but may expect that the text, even when condensed as in the case of pure bacteriology or morbid histology, should be accurate, should give a clear verbal picture of the condition being dealt with and that subjects should be easily found in their appropriate places. This is not always the case; a few examples may be given. Under rinderpest, no reference is made to the use of goat-passaged virus as a method of immunisation, though this method has now been used successfully on a large scale for many years in India. Under Brucellosis (page 805) we read: "Calves which are more or less mature when born, or even those born at term, usually die in one or two days or soon afterwards with symptoms of septicaemia, but cases also occur in which calves of infected cows remain alive and healthy," and on page 808, "after abortion or calving in the great majority of cases they (agglutinins and complement-binding antibodies) disappear from the blood in six months, but sometimes they remain for a considerably longer period, even for years." (It is common experience, in Great Britain at least, that calves born of infected mothers at full time usually develop normally and that it is usual for antibodies to remain in the blood of the cow for years.) Three lines only are given to Brucella vaccine of modified virulence for cattle. Under Johne's disease on page 676, it is suggested that the causal organism may propagate in the open—surely an incorrect statement and one which is contradicted by the text at the head of the page where it is stated that the temperature limits of growth are 28° C. to 43° C.

The arrangement of subjects in a work on veterinary medicine must always be difficult (in our sense of the word, Hutyra, Marek and Manninger is essentially a text-book of medicine and not of bacteriology and pathology). It is surprising to find, however, that the section on "acute general infectious diseases" includes purpura haemorrhagica but not equine infectious anaemia, and that the section on "infectious diseases with special involvement of the nervous system" includes only tetanus and rabies, whilst Borna disease, louping-ill, and the American types of equine encephalomyelitis are included in Volume III under "diseases of the brain" although described as "acute specific infective diseases

caused by filtrable viruses." Again grass-sickness appears as a sub-heading of botulism in Volume II, although it is stated that grass-sickness cannot now be accepted as in any way associated with *Cl. botulinus*. The result of treating all the types of encephalomyelitis in one chapter, subdivided according to species, has resulted in most involved reading and sub-headings. Considerable data are also given here regarding Aujeszky's disease, although this disease is dealt with in Volume I. Incidentally, the inclusion of "circling disease" of New Zealand under the heading of encephalomyelitis due to viruses or of unknown aetiology is not in accord with work published some time ago showing that circling disease was associated with a particular bacterium of the Listerella genus. Bovine mastitis appears to have fallen between infectious diseases and local diseases, receiving no mention whatever, although it has received considerable attention in most dairying countries.

In general, the reader must be struck by the number of remedies mentioned, particularly for some of the more obscure diseases, and look for a little more reserve or distinction between those of probable value and the many whose usefulness is at least doubtful. Space might have been saved in this way and by an even more drastic curtailment of views now proved incorrect, and this space devoted to more detailed attention to control methods in practical use.

In general, the new edition is a valuable book of reference but it does not always reach the high standard which one has come to expect of Hutyra and Marek.

The publishers have, as usual, done their part well. The translation is good and bears but little evidence of the original language though the destruction of the foot-and-mouth virus in manure heaps by "spontaneous combustion" could surely have been bettered.

VALUE OF HORSES

Speaking at the annual dinner of the High Peak Shire Horse Society and the Peak and West Derbyshire Walling Association at Alsop-en-le-Dale, the new Parliamentary Secretary to the Minister of Agriculture, Mr. Henry Hunloke, M.P., deplored the decline in horse breeding.

"People are inclined to think," he said, "that the men who built the first internal combustion engine were fine fellows and should be applauded. I am afraid I take an entirely different view. The internal combustion engine has almost ousted the horse in its more useful working categories, and that reacts on the farming community as a whole. You farmers who have horses to do your work are semi-self-supporting because, fortunately, the horses eat oats, not oil, and like to lie on straw, not in a cement garage. In any emergency such as war you will find that horses are needed far more than people believe."

N.V.M.A. DIVISIONAL REPORTS

Mid-West V.M.A.*

ANNUAL GENERAL MEETING AT BRISTOL

The annual general meeting of the above Division was held at Bristol on January 20th, 1939.

The minutes of the last annual meeting were taken as read, on the proposal of Mr. Hewer, seconded by Mr. Golledge.

Letters of apologies for absence were received from the retiring President (Mr. H. S. Robinson), Sir F. Hobday, Captain Abbott and Mr. W. D. Rees.

A letter from the N.V.M.A., embodying a resolution from the Society of Veterinary Practitioners, suggesting that all Divisions should hold demonstrations of *post-mortem* examinations was referred back to council for their consideration.

Election of Officers for Coming Year

The following officers were elected:—

President.—Mr. Esmond Brown.

Vice-Presidents.—Messrs. Robinson, Pugh, A. J. Baxter and W. Tweed.

Hon. Treasurer.—Colonel Henson (re-elected).

Hon. Secretary.—The Secretary tendered his resignation, but he was persuaded to carry on for another year with the help of Mr. C. R. Golledge as Hon. Assistant Secretary.

Auditors.—Messrs. Margarson and Watson.

Council.—The following members were elected on the Council: Messrs. Wm. Robinson, Margarson, Tweed, Moore, Menzies, Hardy, A. J. Baxter, Colonel Henson, Messrs. C. E. Perry, S. V. Golledge, J. R. Hewer, C. R. Golledge, Dr. W. Scott, Messrs. J. R. Barker, Esmond Brown, J. C. Coleman, C. J. Pugh, W. R. Watson.

Representative on the N.V.V.B. Fund.—Mr. W. D. Rees (re-elected).

. . . . .

New Member.—Captain J. A. McCutcheon, of Trowbridge (proposed by the President and seconded by Mr. Golledge), was unanimously elected a member of the Association.

Quack Remedies.—A member made a complaint against a certain quack remedy and the Secretary was requested to send particulars to the N.V.M.A. for their observations with an offer of financial assistance in the event of the matter being taken to law.

Treasurer's Report.—Colonel Henson presented a very satisfactory report. In the general account there are now two 100 Consols, together with a good working balance in hand.

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In the Benevolent Fund account there are three 100 Consols together with a balance in hand.

Secretary's Report

During the year 1938 we have elected five new members (Messrs. Watson, McLaren, Coward, Captain Abbott and Captain Fox) making our total membership 62, plus nine honorary members.

We have held four general meetings and four council meetings during the year, the average attendance at the general meetings being 25, and at the council meetings, 11 out of a possible 17.

At the annual meeting held in January at Bristol, Messrs. Smith & Nephew gave a film display on "The Treatment of Bone Fractures in the Dog and Cat." We are very much indebted to Professor Wright who came down to demonstrate the film and answered questions raised by the members.

At Bath, in April, Mr. Esmond Brown, one of our own members, gave a very practical paper on "Foot-and-Mouth Disease," and I am sure that those who were privileged to be present on that occasion will never forget the way in which the essayist brought out facts and practical experience of the disease during a lifetime spent with the Ministry.

The summer meeting was held at the Royal Veterinary College by kind invitation of Professor Buxton, and again we are indebted to Professor Wright for the Surgical Demonstration and for kindly taking us over the new college buildings.

In October, Dr. Stableforth gave a very scientific paper at Bath on "Mastitis," which produced a very wide discussion. On that occasion we were honoured by the presence of Dr. Brathe, from Norway, and Dr. Hansen, from Denmark.

Mr. Menzies, one of our own members, from Bristol University, kindly gave a course of lectures on Poultry Diseases, which were very much appreciated by the members who attended. There was an average attendance of 14.

Paper.—The President then called on Captain Barker to introduce his paper on "Blood Plasma Changes and Variations in the Female Bovine Toxaemias." [Captain Barker's paper is reproduced at the commencement of this issue of the *Record.—Editor.*]

A good discussion, opened by Dr. W. Scott, followed. The President proposed a vote of thanks to Captain Barker for his paper, this being seconded by the Secretary, who also thanked Captain Barker, on behalf of the Association, for having the paper printed and circulated to the members free of expense to the Association. This was carried with acclamation.

The members and visitors then adjourned for tea.

C. E. Perry, *Hon. Secretary.*

Lincolnshire and District V.M.A.*

Annual Meeting at Grantham

The annual general meeting of the above Society was held at Grantham on February 9th, 1939.

The President, Major A. N. Foster, occupied the Chair, and the following were present: Messrs. W. W. Lang, R. Hudson (Hon. Associates); Messrs. H. H. Truman, J. H. Poles, M. R. MacFarlane, R. Swaby, C. Weighton, G. Gibson, G. Eaton, W. A. Dickinson, R. S. Smyth, G. A. Moore, R. W. Callaghan, T. J. Keall (Members); Messrs. F. T. Day and W. J. Ironside (Visitors).

The minutes of the last meeting, having been published in the *Veterinary Record*, were taken as read and signed by the President.

Correspondence.—Apologies for absence were received from Sir Frederick Hobday and Messrs. S. Littler, C. W. Townsend, A. J. James, F. W. Gooch, F. W. L. Gooch.

Letters were read from: (1) The Secretary of the National Veterinary Medical Association with reference to (*a*) Poultry Diseases; (*b*) *Post-mortem* Demonstrations, etc.; (*c*) letter of protest to the British Broadcasting Corporation. The Secretary was instructed to write to the Director of Talks supporting the letter of the N.V.M.A.

(2) The Royal Sanitary Institute. It was unanimously agreed to ask Mr. F. W. Gooch again to attend this Congress as this Association's delegate.

(3) From the Secretary of the Eastern Counties Association referring to the entertainment of those attending the Congress at Yarmouth. It was agreed, on the proposition of Mr. Poles, seconded by Mr. Lang, that this Association join with the Eastern Counties in the entertainment to be provided at the Congress, and that the cost of this entertainment should be borne by the two Associations in the proportion of their membership numbers. It was also agreed that the details of this entertainment should be left in the hands of the Provisional Committee, and that all members should be asked to contribute to this entertainment fund if necessary.

Secretary and Treasurer's Report.—The Hon. Secretary and Treasurer now submitted his report for the year 1938-39, in the course of which he stated that he was happy to be able to say that the finances of the Association were in quite a sound position. The Association started the year with £21 15s. 0d. in hand and ended it with £15 0s. 0d. in the bank and a

*Received for publication March 13th, 1939.

further £15 owing for subscriptions. During the year the Association gave ten guineas to various charitable organisations and also organised a refresher course of lectures on poultry diseases. The latter cost the Association only £5 14s. 0d., as those attending the course paid one guinea for the privilege with the exception of one non-member who paid two guineas; eleven members and one non-member attended. The accounts for this course were not shown separately but included in the general accounts of the balance sheet.

The membership of the Society was now eight Honorary Associates and 41 Members.

Mr. Gibson added that he was handing round for their consideration the Victoria Veterinary Benevolent Fund's collecting box, which contained only one pound when emptied at Christmas this year.

The report and the balance sheet (also submitted by the Hon. Treasurer) were adopted.

ELECTION OF OFFICERS

President.—On the proposition of Major FOSTER and seconded by Mr. KEALL, Mr. J. H. Poles was unanimously elected President for the forthcoming year.

Mr. POLES, in a short speech, thanked Major Foster for proposing and the members for electing him as President. He was very pleased to accept the office, and would do anything he could to further the cause of the Association and keep it running in harmony with their colleagues.

Vice-Presidents.—As usual, the last three Presidents were elected Vice-Presidents, *viz.*, Major Foster, Messrs. C. W. Townsend and R. Swaby.

Hon. Secretary and Treasurer.—On the proposition of Major FOSTER, seconded by Mr. POLES, Mr. W. Gibson was again elected to the offices of Secretary and Treasurer.

Mr. W. Lang was elected to represent the Association on the Council of the N.V.M.A.

New Members.—Mr. R. Muir, Rodney Hotel, Horncastle, and Mr. J. McIndoe, Mareham-le-Fen, Boston, having been nominated by Mr. R. S. Smyth and seconded by Mr. Walpole, the above will come up for election at the next meeting.

Paper.—Mr. F. T. Day, M.R.C.V.S., then presented his paper, "Some Observations on the Causes of Infertility in Horse-breeding," the discussion being opened by Mr. W. Gibson. [Mr. Day's paper, and a report of the discussion and of the essayist's reply, are reproduced earlier in this issue of the *Record.—Editor.*]

There were no *post-mortem* specimens, but Mr. W. GIBSON showed a new type of electric firing iron that could be used for line firing, punch firing or pin firing. This was very simple in construction, required no special electrical knowledge to handle, was very efficient in action and much cheaper than most models on the market.

Votes of Thanks.—A vote of thanks was passed to the essayist for coming and giving such an interesting paper, and a similar tribute was accorded the retiring President, Major A. N. Foster, for the very able manner in which he had carried out his duties during his year of office.

Demonstration.—At the conclusion of the meeting Mr. DAY gave a short practical demonstration on an aged thoroughbred mare, of his methods of examining the genital organs. As the mare had a small ovarian cyst this was punctured by means of a trochar.

WM. GIBSON, *Hon. Secretary.*

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West of Scotland V.M.A.*

MEETING AT GLASGOW

A general meeting of the Division was held in the Glasgow Veterinary College on Wednesday, March 15th, at 8 p.m.

The President, Mr. S. G. Abbott, occupied the Chair and the following members were present: Messrs. J. F. Taylor, W. Harley, J. G. McGregor, Jas. Andrew, J. M. Mitchell, W. Watt, A. Sillars, R. M. Smith, P. S. Watts, Jas. McFarlane, W. Anderson, W. M. Jackson, Donald Campbell, A. M. K. McLeod, A. S. Chapman, Miss H. J. Mitchell, Messrs. S. Jamieson, A. Pottie, A. H. Stark, A. H. Robb, W. L. Weipers, Professors W. Robb and G. W. Weir, Mr. N. Nicholson and the Hon. Secretary, Mr. A. Thomson. The following visitors were present: Professors W. M. Mitchell, Geo. F. Boddie, Messrs. Geo. A. Sangster, J. C. Hamilton, E. R. Mackay, J. E. Wilson, J. M. Fletcher, A. L. Wilson, Jas. M. Robertson, J. G. O'Sullivan, George Dykes, M. McColl, R. F. Taylor, Jas. Geddes and R. E. McGrath.

The minutes of the last meeting, having been published in the *Veterinary Record*, were taken as read and adopted.

The receipt of apologies for inability to attend was intimated from Dr. A. W. Whitehouse and Mr. M. H. W. Miller.

Mr. P. S. Watts, having been nominated for membership of the Division at the last meeting, was elected unanimously. The President proposed the nomination of the following: Mr. A. B. Kerr, Mr. G. G. Rennie, Mr. J. M. Fletcher, Major Alex Douglas, Mr. R. E. McGrath, Mr. J. G. O'Sullivan. These nominations were seconded by Professor Weir.

The PRESIDENT intimated that the purpose of this meeting was to allow of discussion of the letter received by all members of the profession

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from the President of the R.C.V.S. and suggested that, in order to allow of free discussion of the matter, the meeting should go into committee. This was agreed to, and a very full discussion took place in which most of the members took part. Arising out of the discussion it was agreed by a majority that the following resolution be sent to the Council, N.V.M.A. and the Council of the Scottish Branch:—

Resolution.

"That this meeting approves of the principle of free treatment by the profession to animals of the poor, but it is not prepared to accept the arrangement come to between the R.C.V.S. and the P.D.S.A. without further consideration."

The meeting concluded with a vote of thanks to the President for his conduct in the Chair.

ALEX. THOMSON, *Hon. Secretary.*

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

May 8th.—Meeting of the Editorial Committee, N.V.M.A., 4 p.m.

May 8th.—Animal Management Examination begins.

May 10th.—Meeting of the Lancashire Division, N.V.M.A., at Manchester, 2.30 p.m.

May 15th.—Rome Congress on Comparative Pathology begins.

May 18th.—R.C.V.S. Council Election Voting Papers issued.

May 25th.—R.C.V.S. Council Election Voting Papers due.

June 1st.—**Annual General Meeting, R.C.V.S.**

June 1st.—**Annual General Meeting, V.V.B.F.**

June 8th.—D.V.S.M. Examination begins.

June 20th.—R.C.V.S. Committee Meetings.

June 21st.—R.C.V.S. Committee Meetings.

June 21st.—**R.C.V.S. Annual Dinner.**

June 22nd.—R.C.V.S. Committee Meetings.

June 23rd.—R.C.V.S. Committee and **Council** Meetings.

July 23rd—28th.—N.V.M.A. Congress at Great Yarmouth and Gorleston-on-Sea.

National Service Register

The Registrar of the R.C.V.S. reports that over 900 members have filled up and returned the cards indicating their willingness in case of national emergency to accept such work as may be offered to them in accordance with the preferences indicated on the card.

Those members who have not yet returned the cards are asked to do so without delay, in order that the information may be as complete as possible. Members who consider that they are already engaged on work of national importance should nevertheless return the cards and are at liberty to state on them that they limit the offer of their services to the district in which they are at present practising. The more complete the Central Register is the better will be the means of organising the profession to the best advantage in case of an emergency.

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VETERINARY STUDENTS AND MILITARY SERVICE

In an early issue we shall be publishing reports of meetings recently held by the Council of the Royal College of Veterinary Surgeons. As the question of compulsory military service for certain veterinary students will be exercising the minds of many, however, we take this opportunity of stating that, at the special meeting of Council held on April 27th, as a matter of emergency the Secretary reported that he had been in communication with the Ministry of Labour, Ministry of Agriculture and the War Office in regard to the position of veterinary students and their liability for military service. Dr. Bullock also said that, in order to enable him to do what was possible to safeguard the interests of the students in relation to their professional examinations, he was obtaining information from the Principals of the Veterinary Colleges as to the number of students affected and their college status.

The Council decided that the matter should be left in the hands of the President and the Secretary, to take such action as may be necessary.

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NOTICE RE DRAFT SCHEME FOR COLLABORATION WITH ANIMAL WELFARE SOCIETIES

Arising out of the publication in our issue of April 29th of the details of the draft scheme for collaboration between the R.S.P.C.A., the S.S.P.C.A. and the profession, the Hon. Secretary of the N.V.M.A. wishes us to make it plain that although discussions took place between representatives of the profession and Captain MacCunn, the Chief Secretary of the R.S.P.C.A., and Mr. Langwill, Secretary of the S.S.P.C.A.,

concerning the draft scheme, before it was submitted to the Council of the N.V.M.A., this scheme has not yet been considered officially by either Society. It is perhaps as well to make it clear that until the scheme has been considered and adopted by the Councils of the Societies, it cannot in any sense be regarded as final. Any proposed amendments will be carefully considered by the Organising Committee and referred again to Council. We are pleased to learn that Captain MacCunn has recently seen Mr. Langwill and discussed the details with him and we look forward to hearing fairly soon the official views of the Societies.

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PERSONAL

Appointment.—Mr. H. E. Harbour, B.A., M.R.C.V.S., has recently taken up his duties as Assistant Veterinary Investigation Officer at the University College of North Wales.

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Sir Frederick Hobday, Companion of the Order of St. Michael and St. George, was among the members of the Order who took part in the processions at the annual service—attended by the Duke of Kent, Prince Helena Victoria, and Princess Marie Louise—held in St. Paul's Cathedral on Saturday, April 22nd. The underlying motive of the service is to commemorate the departed: and the ceremony has as its central act the removal of the banners of those Knights Grand Cross who have died during the year and the substitution of the banners of newly created Knights Grand Cross.

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R.C.V.S. OBITUARY

Hutchinson, Fred, "Rockleigh," Hilton Road, Natal, South Africa. Graduated N. Edinburgh, May 30th, 1889. Died April, 1939; aged 70 years.

Colonel Fred Hutchinson, M.R.C.V.S.

The *Howdenshire Gazette* reports that news has just been received of the death, at "Rockleigh," Hilton Road, Natal, of Colonel Fred Hutchinson, M.R.C.V.S., eldest son of the late Mr. Miles Hutchinson, of Newsholme Park, Howden, and continues:—

"Colonel Hutchinson, who was 70 years of age, graduated at the Edinburgh college. In his younger days he was well known in the Howden district, and practised as a veterinary surgeon at Goole and Swinefleet. He left England for South Africa in 1895 to manage a stud farm for the late Mr. Darrell Smith, and was later appointed veterinary surgeon for Natal for the Government. He was in the last train which left Ladysmith before the historic siege in the Boer War.

"In the early stages of the Great War he acted as examining officer for cavalry horses at Durban, and at the end of the War was appointed chief veterinary officer for the Transvaal, a post he held under the Government until his retirement ten years ago. He was a friend of Smuts and General Botha, and was offered a post by General Botha on his staff when operations were begun against the Germans in South West Africa.

"Colonel Hutchinson last visited England in 1931. He leaves a widow, and his daughter, Miss Gladys Hutchinson, spent some years at Eastrington, as did his son, Mr. Eric Hutchinson, who was killed in the War."

LEGAL NOTES

Sale of Bull: Alleged Breach of Warranty.—Before Judge Cotes-Preedy at the Oxford County Court recently, Neil McKinna Barron, of Clapham Farm, near Worthing, sued Major R. W. Cooper, of Tackley Park, Oxon, for £20 2s. damages for breach of warranty.

Mr. H. Brown, for the plaintiff, said that although the amount claimed was small, the point involved was one of importance to the plaintiff and the farming community generally. It was whether on a public sale of pedigree cattle there was an implied condition that the bull was reasonably fit for the only purpose for which a purchaser would buy it, namely, for service.

Mr. Barron was a farmer in Sussex and Major Cooper was a breeder of pedigree cattle. On August 31st last there was a public sale of pedigree cattle at Reading in which Major Cooper had three lots. The bull in question which Mr. Barron bought was "Valentine's Galore V.," of Maple Lodge. The details given of this bull were obviously intended to attract a purchaser and show that it was a bull for breeding purposes. The bull was apparently two-and-a-half years old and Mr. Barron purchased it for stud purposes for 20 guineas.

"Immediately before the auction of this bull," declared Mr. Brown, "Mr. Barron spoke to Major Cooper's head herdsman and asked him if it was suitable for breeding and a good stock getter. The herdsman replied 'It is quite all right. It is quite a good stock-getter and all right for service.' That is the expression of warranty on which Mr. Barron purchased in this case." Mr. Barron put the bull to service on ten occasions and it failed on all but one occasion, when it only half-served a cow. The bull was eventually sold in the open market for £10 15s.

Mr. Brown referred to correspondence which had taken place on the matter. Mr. Barron had referred the matter to the Sussex branch of the National Farmers' Union, who wrote to Major Cooper pointing out that the bull had been certified by a veterinary surgeon as useless for service. Major Cooper replied that he never negotiated with anyone except the person purchasing an animal from him. Further attempts to settle the matter privately had proved unavailing.

Mr. Barron, in the witness-box, corroborated as to the assurance of Major R. W. Cooper's head herdsman that it was perfectly quiet, a good stock-getter and right for service.

Cross-examined by Mr. Guest, he admitted that one of the conditions of sale printed in the catalogue was that after sale animals should be removed "with all faults and errors of description."

Replying to Mr. Guest, Mr. H. Scott Dunn, a Hove veterinary surgeon, admitted it was quite possible for a bull to go off service suddenly due to change of surroundings and attendants.

Major Cooper said the bull had not served any cows for nine or ten months before it was sold, because it had served its allotted number of cows. He kept the bull in case he was required because of infertility in other bulls he had. It had sired seven calves before it was sold. It was most unfair to use a bull before it had been on the farm a week, because it had to settle down in its new surroundings.

The Judge suggested it should be possible for the parties to come to an agreement. "I have been very impressed by the fair way in which Mr. Barron and his witnesses have given their

evidence, and I shall be only too willing to settle the case," Major Cooper replied.

Later Mr. Brown announced that a settlement had been agreed on between the parties, and asked for an order for costs on Scale B with a qualifying fee for the veterinary surgeon. "Mr. Barron recognises, now that he has heard Major Cooper in the witness box, and has had an opportunity of speaking to him privately, that he would not consciously put an incompetent animal into any sale. He does not want the case to finish with any feeling against the *bona fides* of Major Cooper," he said.

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AIR RAID PROTECTION FOR HORSES IN TOWNS

At the headquarters of the R.S.P.C.A. in London, on Tuesday last, Sir Robert Gower presided over a conference (attended by members of the N.V.M.A. Council's Air Raid Precautions Sub-Committee) of horse owners, drivers, veterinary officers, and organisations concerned in the welfare of horses, to consider the best measures for protecting horses in towns in a national emergency.

The Chairman said that 19 of the organisations who were represented at the conference employed nearly 18,000 horses, one of them, the L.M.S. Railway Company, owning 7,500 of them. Some 40,000 horses were estimated to be employed in the metropolitan area. The association's pamphlet would show that they were not satisfied with the provisions for horse protection in A.R.P. plans, and any decision of the conference could be placed directly before the Government.

The Duke of Portland said he was glad to see that the R.S.P.C.A., which was to the forefront in protecting horses during the Great War, was again showing equal enterprise. Anything that would lead to the prevention of casualties and the reduction of terror which horses felt when bombardment took place would have his strongest support.

Sir Charles E. Hardinge suggested that measures for protection against gas could be left to the veterinary surgeons. It did not require much imagination to realise what a great danger a loose horse would be to those whose duties would take them into the streets during air raids. Human beings must be considered before animals, but if they could devise at the same time something which would make it safer for both human beings and horses, it would be worth while.

Colonel R. J. Stordy, M.R.C.V.S., a member of the R.S.P.C.A. Council, demonstrated equipment which might be used to control horses in the street. He thought it would be advisable for drivers, when danger threatened, to park their vehicles in side streets, mews, or other accessible places off the main roads, where horses could be unharnessed and led to open spaces such as parks to avoid the danger of falling masonry. In other cases it might be found necessary to tie up horses.

Among those who took part in the discussion were Mr. H. E. Bywater, M.R.C.V.S., of West Ham; Mr. J. Higgs, of United Dairies; Major H. Faudel Phillips; Major Brennan DeVine, of Birmingham (President, N.V.M.A.); Mr. E. Upton, of Harrison, Barber & Co.; Dr. W. R. Wooldridge (Hon. Secretary, N.V.M.A.); and representatives of the L.M.S. and G.W. Railway Companies, Carter Paterson & Co.

On the motion of the Chairman, a resolution was adopted appointing a committee of six members of the conference to meet four members of the A.R.P. Committee of the R.S.P.C.A. to draw up a scheme for submission to the Government.

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CONFERENCE ON NUTRITION

Many authorities on the medical and economic aspects of the problem of nutrition participated in the National Conference on the Wider Aspects of Nutrition which the British Medical Association called to focus attention on the need for "a long-term food policy embracing the requirements of health, agriculture, and industry in mutual relation," and which was held at B.M.A. House, Tavistock Square, W.C., during the latter half of last week.

Among the 400 delegates, who were welcomed by Sir Kaye Le Fleming, Chairman of the B.M.A. Council, were representatives of six Government Departments, five oversea Governments, 70 public and scientific organisations, and some 30 industrial and commercial undertakings. The opportunity will be taken, in later issues of the *Record*, to deal at some length with those papers of particular interest to our readers, considered at this important conference.

Lord Horder, who presided at the opening session, said that the problem of malnutrition had become urgent with doctors, and that conference should be the end of their talking. It should be the means of marshalling once for all the facts relating to the medical aspects of nutrition, to home agriculture, to oversea food production, and to questions concerning food consumption. There should emerge from their discussions a definitive pronouncement on the factors which could resolve the present intolerably primitive situation.

Sir Arthur Salter, M.P., in his inaugural address, dealt with both the strategic and economic phases of the food problem, emphasising the urgent need to meet the danger to our food supplies by providing food reserves on a much greater scale than hitherto. Turning to peace-time policy, Sir Arthur Salter suggested that good food was not the only major factor in health; housing, conditions of work, and facilities for exercise were also of great importance. That the poor were only able to get a third as much milk as the rich meant that the children of the former were starved of the most important food needed for their health.

Professor E. P. Cathcart, Regius Professor of Physiology, Glasgow University, said that the problem of nutrition was a much more subtle one than the mere provision of adequate food. Other essentials for the attainment of perfect nutrition were adequate sleep, fresh air, exercise, and contentment of mind. Diets did not require to be elaborate to supply the essentials as we knew them to-day. A diet made up of brown bread, butter, cheese, milk, vegetables, and fruit would suffice to provide all the essential items. The slogan "Drink more milk" ought to read "Drink more safe milk"; he did not understand the outcry against pasteurisation.

Major-Gen. Sir Robert McCarrison stated that a well-constituted diet of fresh, natural foodstuffs contained all things needful for normal nutrition, so far as food was capable of supplying them, always provided that those derived from agriculture were produced on soils that were not impoverished. Certain races of his acquaintance had discovered that truth for themselves centuries ago, in spite of their ignorance of calories, proteins, or vitamins.

Their diet had a particular interest for the British people. It consisted of whole meal grains, milk and its products, pulses, green leaf and root vegetables, fruit and meat occasionally. He was less concerned with the components of those foods than with their freshness.

Dr. G. P. Crowden, Reader in Industrial Physiology, University of London, in the course of a paper on the medical aspects of nutrition, said he was convinced that improvement in the general state of nutrition of the nation must be sought by considering the needs, and then enlisting the interest and active co-operation of the family.

Agriculture and Nutrition

The Conference, in later sessions, dealt more specifically with above aspect of the problem. Lord Astor read a paper urging that the next social reform should be to abolish malnutrition. He said that an adequate nutrition policy and a properly nourished population needed a change in our present agricultural policy. We needed a largely increased consumption of the health protective foods. Malnutrition was partly due to ignorance, but mainly to poverty. Millions of people to-day simply could not afford to give their children enough health foods to avoid the evils of malnutrition. Milk was far the most important food for nutrition. If children and nursing mothers could have sufficient milk our problem of malnutrition would be largely solved. Yet, after five years of the Milk Scheme, the retail price of milk had risen, and was high compared with other countries.

Lord Astor proposed to subsidise the consumption of home-grown health protective foods for mothers, infants, and children by encouraging local authorities to push ahead with cheap meals at clinics, schools, etc. These, he said, would lead to a big expansion in home production of milk, eggs, vegetables, fruit, and potatoes. He would subsidise research on animal health, make the latest knowledge easily available to farmers, help efficiency by reconstructing out-of-date buildings, improving soil fertility, better housing, schools, water supplies, electricity, and health services in rural areas. He would also alter the structure of the Marketing Boards, and would create a separate Fisheries Department.

Dr. K. A. H. Murray, who dealt with British agriculture and malnutrition, outlined the natural lines of development in British farming over the last 70 years and indicated to what extent it provided those protective foods the lack of which is considered the main cause of the inadequacies of existing diets. He discussed the extent to which those deficiencies could be made good by an expansion of British farming.

Professor W. C. Miller, Courtauld Professor of Animal Husbandry, Royal Veterinary College, London, considered the veterinary aspect of national nutrition—the activities of the veterinarian as a factor in human nutrition schemes—under the following headings: Administrative control of animal disease; Food inspection services; Control and treatment of sporadic and other animal disease upon producers' premises; Positive policy of disease prevention.

At the close of the conference a resolution was passed stressing the importance of nutrition to the national welfare and urging on the Government the formulation of a long-term food policy "in which the requirements of health, agriculture, and industry shall be considered in mutual relation." The conference expressed its conviction that "measures to secure the more ready availability to all sections of the community of foodstuffs which are held to be desirable on nutritional grounds should be accompanied by an educational campaign to encourage their increased consumption."

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BRITISH EMPIRE CANCER CAMPAIGN

On the occasion of the meeting held in support of the Empire Day Appeal of the British Empire Cancer Campaign at the Mansion House on Wednesday of last week, Sir Frederick Hobday, Professor Emeritus of the Royal Veterinary College, was—as a Member of the Grand Council—among the distinguished company present on the platform.

The Lord Mayor, Sir Frank Bowater, who presided, said the Empire Day Appeal was inaugurated by the King when, as Duke of York, he was President of the Campaign. During its 16 years of existence it had raised substantial funds for work in all parts of the Empire, and even among British colonists living in foreign lands. The spirit of national service was in the air, and certainly the attempts at finding the cause of cancer and of improving methods of treatment were branches of national service. Great progress had been made. Some forms of cancer which were regarded at the beginning of the century as hopeless were now known to be curable if taken in time. Although the enemy had not been routed, many of its strongholds had been assaulted and won.

The principal speaker, Mr. Walter Elliot, Minister of Health, said the work of the Campaign was in no small measure responsible for the steady progress being made in their knowledge of the most dreaded disease. A new phase in the attack on cancer had recently opened with the passage of the Cancer Act, which imposed an obligation on the councils of counties and county boroughs to ensure that facilities for diagnosis and treatment were adequate in their areas. The rise in the annual number of deaths from cancer in Britain, progressive for many years and reaching a total of 74,000 in 1937, could not be disregarded.

Even though this increase could be explained largely, though not wholly, by the growing average length of life—for cancer attacked the middle-aged and old more than the young—that in itself was small comfort. Were they to accept the position that the steadily improving system of social and public health services, by lengthening the span of life, contributed to their chances of dying of cancer? The Government, at all events, did not take that view. A concerted attack on the disease was clearly necessary and took the form of the Cancer Act.

It could not be too strongly emphasised that many cases of cancer were not incurable, but might become so if treatment were delayed. Many patients did not receive the treatment most appropriate to their condition, or did not receive it until cure, and perhaps temporary relief, became impossible. There were many reasons for this. There was a deficiency of centres with facilities for modern treatment.

The Cancer Act would remove or lessen many of the difficulties. In most cases the best service would be secured by the joint action of two or more neighbouring local authorities, and provision was made for this in the Act. He was responsible for approving the arrangements, and he would spare no effort to ensure that expert advice and treatment was available to all.

There were psychological as well as material difficulties to be overcome. He hoped the Act would serve to dispel the "bogy of incurability" and encourage patients to realise the necessity of seeking early advice. With regard to research, too little was still known of the causation of cancer and of the relative advantages of the various treatments. It was of the first importance that investigations should be given every encouragement. These two aspects of the problem occupied prominent places in the programme of the work of the British Empire Cancer Campaign. Large sums, derived mainly from voluntary effort, had already been spent on such research with encouraging results.

The new cancer service, which extended facilities for treatment, would provide greater opportunities for clinical research and the accumulation of records, the analysis of which should be of the highest value. He was glad to have assurances from the great voluntary organisations concerned that there would be no relaxation of their fundamental researches. It was on careful designing and, to some extent, co-ordination of research that they must rely to furnish the solution of the basic problems. The outlook had become more hopeful in recent years, and he looked with confidence to the Campaign to play a prominent part in the long-awaited but now, surely, hoped-for victory over this formidable disease.

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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THE LOVEDAY REPORT

To the Editor of the Veterinary Record

Sir,—So much has been published in the *Veterinary Record*, both by the Editorial Committee and by private individuals of more or less weight in the profession, that any further comment on the Loveday Report is perhaps a work of supererogation. But one cannot help feeling that in many instances the depth and insight shown in the report have been overlooked—that some contributors have been unable to see the wood for the trees.

First and foremost is its clarity of expression to be commended; there is seldom an ambiguous phrase, and the whole is pre-eminently readable, and might well serve as an example for many another White Paper. The impression conveyed to the present writer is that the authors have taken the larger idealistic view of the needs of agriculture as the essential national background, rather than the smaller ideological view of the advancement of the profession as an end in itself. There is of course no doubt that, if implemented, the recommendations of the report will provide a wider responsibility for the profession. But it is a mistake, a mistake frequently made, to imagine that any Act, Order or arrangement will raise the status of the profession. This can *only* be done—morally, socially, financially—by us as individuals.

The profession is now unfortunately bound, like Hector to the chariot of Achilles, to the Animal Health Division of the Ministry of Agriculture. Whatever be our opinion of this state of things, it behoves us to do our utmost to provide efficient service. The suggested rearrangement of curricula in the report would inevitably improve matters in this respect. I am particularly interested in those recommendations designed to confer University status on members of the profession. It is difficult to over-estimate the advantage the profession, through its individual members, may derive from this association—even despite the assertions of some of your correspondents—in private practice.

It is too much to hope that the Committee's recommendations will be adopted *en bloc*. But if we press far enough we may get something. Why go pettifogging on about conferring on points of detail when we have a document whose breadth and vision calls out for a visionary approach.

Yours faithfully,

Paul Crosfield.

P.S.—The foregoing was written some two months ago; so many admirably written letters were published in the *Record* that it hardly seemed worth while to bother you with my scattered thoughts. But since then this P.D.S.A. matter—a *comparatively* minor matter—has been drawn like a red herring across the trail of consideration of the Loveday Report. I have therefore considered it appropriate to send you the foregoing letter and to express the hope that the Council of the Royal College will not be allowed to burke a major issue by focusing attention on the recent discussion.—P.C.

Glover's Close,
Chipping Norton,
Oxon.

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BOVINE MASTITIS

To the Editor of the Veterinary Record

Sir,—In his most recent paper (*Veterinary Record*. 1939. 51. 469) Dr. Stableforth once again condemns the use of autogenous vaccine for the control of streptococcal mastitis. It is unnecessary to repeat my methods, which involve the use of autogenous vaccine, for the control of bovine mastitis, particularly as so many of my colleagues in practice have long been familiar with them.

But the purpose of this brief letter is to draw Dr. Stableforth's attention to the following words in his article: "Vaccination does not rid them of infection in the udder but at most makes the disease (streptococcal mastitis) less obvious. Vaccination therefore merely hides the disease to some extent and is to be deprecated." Would Dr. Stableforth kindly present us with the details of the technical procedure for determining exactly how a vaccine makes a disease less obvious, or hides a disease to some extent.

I have the honour to be, Sir,
Your obedient Servant,
Tom Hare.

Veterinary Research Laboratories,
288, Finchley Road, N.W.3.
April 21st, 1939.

WALES AND THE ANIMAL INDUSTRY

To the Editor of the Veterinary Record

Sir,—I thank Professor Share Jones for his reply to my criticism of his Cardiff address in relation to his assessment of £200,000 per week lost to British farmers, as published as a leader in the *Farmers' Weekly* of April 22nd.

I also acknowledge the helpful views of Mr. D. J. Anthony's letter, in this week's *Veterinary Record*, in clearing up some points, but more than ever strengthening my contention that no such sum of money is lost. Mr. Anthony is correct in his observations as to the criticisms being based on the condensed, or curtailed, report appearing in the *Farmers' Weekly*, but it would appear that the basis of this report is a true picture of Professor Jones's address. There is one additional adjective included in his reply this week which co-relates with Mr. Anthony's letter, and it is "derelict *little* mills and factories that once produced Welsh blankets, etc.," and "*little* leather works, etc." I appreciate this qualifying adjective, as in my own district mills and tanneries are departed industries, but this is surely explained by the trend of the times we live in; mass production, specialised output and oncost charges. There are in the leather and woollen trades to-day, processes which are only economically feasible on a large-scale production.

Replying to Professor Jones's reiteration of Welsh sheepskins being sold at fourpence, may I state that, as one of a family actively engaged in the hide, skin, tallow and wool trade for the last three generations, market values are well known to me; I have records which disprove any such price, even in slump years, as representing market value of sound marketable skins; scabbed, broken or dried single skins can make such a price even in normal times, but this can never be taken as the value of sound skins.

Surely Professor Jones's last letter, coupled with Mr. Anthony's, brings us to the fact that the original "British farmer" should read "Welsh farmer" which strengthens further my contention that no such figure as £200,000 per week represents a true valuation of palpable losses. His mention of Mr. Roger Duncalfe is another nail in the coffin, as my knowledge of Mr. Duncalfe and the ramifications he represents precludes the possibility of even a share of workable by-products represented by this figure being allowed to pass unnoticed.

I admitted the possibility of "some forgotten areas" but it is unfair to take what may be a loss in some small area, multiply this by the numbers of animals killed in Great Britain per week, and quote the answer as being applicable everywhere. It is such mis-statements which may ultimately lead to farmers carrying the cross of "centralised slaughtering." The "Powers that Be" seem to think, as Professor Jones assumes, that vast sums of money are lost in by-products going down the drain. It is my humble opinion, confirmed by practical killers, that centralised slaughter will cost the consumer or (most likely) the farmer at least twopence per pound on mutton. Travelling a distance to such a centralised slaughterhouse will result in a loss of carcase deadweight of 1½ to 2 lb. per sheep, which represents on an average Smithfield price of tenpence per pound approximately 1s. 6d. per sheep; add further expensive rates, dues and freights and the result is as I have stated. This centralising, with a view to processing blood, paunches and possibly glands, will never under any circumstances make up for this loss of carcase weight.

It *is* economical, and the practice in Scotland, to collect over a wide area these by-products, with their much smaller bulk, and process them in a central by-product factory.

Professor Jones infers that I quote Chicago packinghouse routine when I enumerate all the products of slaughter. May I reiterate that in Scotland we handle *and pay for* the skins, fats, gut, blood, glands, feet, heads and plucks, and I am prepared to send him a flowsheet of by-products in Scotland and, if he cares, a list of firms handling them. Please do not think that I favour the widely prevalent practice in England and Wales of private slaughterhouses, better described as dumps in some cases, where hygiene and efficiency are nil. There is a vast difference between centralised slaughter and the elimination of dumps for killing in favour of municipal abattoirs under proper sanitary and meat inspection, keeping in mind, however, the utility of licensed private slaughterhouses catering exclusively, as they are in Scotland and parts of England, for the "export trade," *i.e.*, Smithfield Meat Market.

Professor Jones quotes the results of investigations of Worcester County Council showing losses in the ox amounting to millions of pounds per annum. I have not a copy of this report and would be pleased to have one. The ravages of tick, warble, and barbed wire, affecting the leather industry, are known to me, likewise the unavoidable losses in processing woollens, but even these trades have refuse or scrap materials, which, when passed on to a branch of the by-product industry, become valuable raw material. I do not agree that such practice may tend to isolate each section at the expense of another, rather do I hold that it makes for efficiency.

I have some small knowledge of animal physiology and husbandry and appreciate Professor Jones's references to agra-economics. I have long endeavoured to further the contact between the farmer and the by-product manufacturer, using the products of slaughter as a means of completing somewhat Nature's cycle by returning as much as possible to the land that which originally came from it.

I would willingly co-operate with Professor Jones in co-ordinating agriculture and related industry to the amelioration where possible of difficulties in animal husbandry (so simply yet well defined by him), provided always that we were not chasing an elusive £200,000 per week.

Yours faithfully,

Robert G. McQueen,

W. & J. Dunlop, Ltd.,
Hide, Skin and Tallow Brokers,
Animal By-Products Manufacturers,
Dumfries.

May 1st, 1939.

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To the Editor of the Veterinary Record

Sir,—In his communication, Mr. D. J. Anthony refers to Sir Malcolm Stewart as: "now Lord Portal."

This is an error. Lord Portal was formerly Sir Wyndham Portal, Bart., and the Portals have resided at Laverstoke, Hants, since the Edict of Nantes, being Huguenot in origin.

It is at Laverstoke that Portals, Ltd., make the paper on which the Bank of England notes are printed.

I do not happen to know who Sir Malcolm Stewart is, but "indeed to goodness" it is not Lord Portal.

Yours faithfully,
J. F. D. Tutt.

"Rothiemurchus,"
St. Cross,
Winchester.

* * * * *

THE LATE MR. HENRY GRAY

To the Editor of the Veterinary Record

Sir,—Dr. Marie Phisalix, of the Museum National d'Histoire Naturelle, Paris, writes:—

"*The Veterinary Record* tells me of the death of dear Mr. Henry Gray. With great emotion I have read your true and fervent tribute to the memory of our friend. Mr. Henry Gray was one of those men who neglect nothing, and whom one could never forget, not only for his vivid personality, but for his invigorating and agreeable courtesy. The influence of his good nature was such that one would have wished to live in closer touch with him."

"Since 1902, when we became acquainted, we have remained friends, although throughout this period we have not often seen one another. Not a Christmas has passed without my receiving his greetings-calendar, the last of which is now hanging in my laboratory. Thus every day for 36 years I have been able to look upon this token of his constant and affectionate remembrance."

"When Mr. Gray first became interested in our research [Dr. Marie's and her husband's] it was I who conducted the correspondence, and without realising that he might be misled I used to sign myself 'Dr. Phisalix.' When, on a visit to Paris, he learned that it was with me that he had been corresponding, his embarrassment was considerable and most entertaining. Nevertheless the incident brought out his natural courtesy; he was a born gentleman in the best sense of the word; and he was faithful to his friendships."

"I hope you will allow me to join my most sincere regrets with yours and with those of his family."

On my request Madame Marie Phisalix has kindly permitted me to translate the above extracts from one of her letters. I felt that such an appreciation of our late colleague by a universally renowned scientist would be prized by our profession.

I have the honour to be, Sir,
Your obedient Servant,
Tom Hare.

Veterinary Research Laboratories,
London, N.W.3.
April 29th, 1939.

The Editor acknowledges, with thanks, the receipt of the following:—

Communications from Dr. R. Lovell (London), Mr. J. F. Macdonald (Tonbridge), Mr. T. M. Mitchell (Sunderland) and Professor J. G. Wright (London).

Reports from the Hon. Secretaries of the following Divisions, N.V.M.A.: Eastern Counties, North of England, Royal Counties, Scottish Metropolitan, South Wales.

Town Council of Springs, South Africa.—Eighteenth annual report of the Medical Officer of Health.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT OF 1937 (PART IV)

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks reported by the Local Authorities.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 1st to 15th April, 1939	42	46	—	—	2	6	1	67	46
Corresponding period in									
1938	54	59	28	3,221	4	9	3	21	22
1937	40	44	—	—	5	6	13	48	23
1936	29	34	—	—	6	9	5	93	40
Total 1st January to 15th April, 1939	304	326	29	4,357	21	42	140	405	228
Corresponding period in									
1938	313	329	141	18,379	36	58	85	117	74
1937	218	249	3	262	62	94	109	359	202
1936	182	221	4	379	55	176	125	645	444

Note.—The figures for the current year are approximate only.

§ Excluding outbreaks in Army Horses.